# **PHILIPS**





PM 6622

# Operating manual



PM 6624



PM 6625

## **IMPORTANT**

In correspondence concerning this instrument, please quote the type number and the serial number as given on the type plate on the rear of the instrument.

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## I. INTRODUCTION

## **GENERAL INFORMATION**

The counters in the PM 6620-series have frequency ranges from D.C. up to 80 MHz, 520 MHz and 1 GHz respectively for the PM 6622, PM 6624 and PM 6625.

All models can measure frequency, ratio, period, time interval and have a totalizing mode.

Optional accessories such as four different oscillators, a battery unit, a BCD output unit, a D/A converter and a BUS interface system extend the range of application.

## II. TECHNICAL DATA

Properties expressed in numerical values with statement of tolerances are guaranteed. Numerical values without tolerances are intended for information purposes only and indicate the properties of an average instrument. The numerical values hold good for the nominal mains voltage.

## A. MEASUREMENTS

## Frequency

Range DC ... 80 MHz. Input A. All models

50 . . . 520 MHz. Input C. PM 6624 50 . . . 1000 MHz. Input C. PM 6625

Gate times 10 ms, 100 ms, 1 s and 10 s. Input A
Resolution 100 Hz, 10 Hz, 1 Hz and 0.1 Hz. All models

Accuracy ±1 count ± time base error

Single Period B

Range 100 ns... 10<sup>5</sup> s (DC... 10 MHz)

 $\begin{array}{ll} \text{Frequency counted} & \quad \text{10 MHz or 10 kHz} \\ \text{Time resolution} & \quad \text{100 ns or 100 } \mu \text{s} \end{array}$ 

Accuracy ±1 count ± trigger error\* ± time base error

Period average B

Range 1 Hz ... 10 MHz
Frequency counted 10 MHz

Frequency counted 10 MHz

Number of averagings  $N = 10^2$ ,  $10^4$  and  $10^6$ 

Time resolution  $\frac{100 \text{ ns}}{N}$ 

Accuracy  $\pm 1$  count  $\pm$  trigger error\*/N  $\pm$  time base error

Time interval A-B

 Single
 Average

 Range
 100 ns...105 s
 1 ns...1 s

Frequency counted 10 MHz or 10 kHz 10 MHz
Time resolution 100 ns or 100 μs 100 ns

Number of averagings  $N=10^2$ ,  $10^4$ ,  $10^6$  Min. time stop to start 250 ns

Accuracy  $\pm 1$  count  $\pm$  trigger  $\pm 5$  ns  $\pm$  time base error  $\pm 100$  ns  $\pm$  trigger error\*\*

Time interval repetition rate max. 5 MHz max. 4 MHz

#### Count A

Range

1 to 999999999

Mode

Accumulates pulses on channel A during time interval between start and

stop signal or gate signal at input B

Pulse pair resolution

#### Frequency ratio A/B or C/B

Range

fA: DC . . . 80 MHz. All models fB: DC . . . 10 MHz. All models fC: 50 . . . 520 MHz. PM 6624 fC: 50 . . . 1000 MHz. PM 6625

Multiplier

 $N = 10^4$  and  $10^6$ 

Accuracy

±1 count ± trigger error\* of B

Check

10 MHz internally applied to channel A and B

HOLD OFF on

The hold off duration will be displayed if SINGLE PERIOD B is selected.

PM 6622.

#### **Auxiliary functions**

Reset

Pushing RESET button resets the counter, releasing it starts new measure-

Start/Stop and Gated by B

In function COUNT A the gate time is controlled either by start/stop or

gate signal at input B.

Mode of operation is selected by a slide switch at the front panel.

Display time

Continuously variable between 0.2...5 s and infinite of display time knob

is pulled.

Stand by

The switch is combined with display time control. Position STAND BY

keeps an oven oscillator heated.

Memory

Switchable by push-button MEMORY

Trigger hold off Range

Active in the time-interval and the period mode. PM 6622.

Approximately  $10...500 \mu s$ ,

 $500 \mu s \dots 100 ms$  if control knob is pulled. Hold off time is monitored at output gate open.

\* Trigger error is  $\leq \pm 3 \times 10^{-3}$  for sine wave signals with signal to noise ratio of  $\geq$  40 dB.

\*\* Trigger error for any wave shape is  $\leq \pm \frac{2.5 \times 10^{-3}}{\text{Signal slope (V/ns)}}$ 

# **B. INPUT CHARACTERISTICS**

#### Input A and B

Range

Sensitivity

Impedance

Coupling

DC coupled AC coupled DC . . . 80 MHz

100 Hz ... 80 MHz | Input B is functionally limited to 10 MHz

Sine wave: 20 mV $_{\rm rms}$ 

Pulses: 60 mV  $_{\rm p\cdot p}$  for pulse width  $\geq$  6 ns

 $1 M\Omega//25 pF$ DC and AC  $\times$  1 and  $\times$  10

Attenuation Trigger level

Preset 0 V or variable between ±2.5 V with high resolution around 0 V.

Safe overload

Attenuation  $\times$  1

 $\leq$  440 Hz : 250 V DC or 230  $V_{\rm rms}$  $\geq$  440 Hz: falling to 12  $V_{\rm rms}$  at 1 MHz

Attenuation × 10

Max. 250 V DC or 230  $V_{\rm rms}$ .

#### Input C

PM 6624 (Not present in PM 6622) PM 6625 50 . . . 520 MHz Frequency range 50 . . . 1000 MHz Dynamic voltage range 10 m $V_{rms}$  . . . 12  $V_{rms}$ 10 mV  $_{rms} \dots$  12 V  $_{rms}$ (-27 dBm . . . +35 dBm) (-27 dBm ... + 35 dBm)Impedance  $50 \Omega$ 50 Ω **VSWR** <2 <2 Coupling AC AC Attenuation by automatic PIN diode attenuator, maximum 62 dB. Prescaling factor 16 12  $V_{\rm rms}$ 12  $V_{\rm rms}$ Safe overload AM tolerance 98 % at 5 kHz modulation frequency All models 30 % at 1 MHz modulation frequency

D OUT/IN 10 MHz

External oscillator input or internal oscillator output. Selectable by a switch

at the rear panel.

Range 1 kHz . . . 10 MHz
Sensitivity 500 mV<sub>rms</sub>
Coupling AC

**EXT. RESET/START** 

O V  $\pm$ 0.4 V applied to EXT. RESET input will reset the counter.

If DISPLAY TIME is set to position  $\infty$  one new measurement will be initiated when the EXT. RESET is returned to > +2.4 V (max. 5.5 V) or the

input is left open. Max. 0.4 mA at 0.4 V

Input current

\* Above 960 MHz, the sensitivity of the PM 6625 might drop to 14 mV  $_{\rm rms}$  (—24 dBm) at 1 GHz

## C. OUTPUT CHARACTERISTICS

D OUT/IN 10 MHz

Internal oscillator output or external oscillator input. Selectable by a switch

at the rear panel.

Output frequency Signal level

Internal oscillator frequency, 10 MHz.

Output impedance

 $\approx$  1  $V_{rms}$ , open circuit.  $\approx$  200  $\Omega$ , short circuit proof.

Coupling

DC

**GATE OPEN** 

Output level < 0.4 V during main gate open

 $\approx$  1.5 during hold off time. PM 6622  $\geq$  2.5 V during main gate closed.

Output impedance

pprox 400  $\Omega$ .

Delay

Internal delay between the signal inputs and the trigger monitor output is

approximately 65 ns.

DISPLAY

9 digits.

In plane 7 segment gas discharge display with decimal point indication.

Gate lamp

Indicates that main gate is open and counting takes place.

In stand by position the Gate lamp indicates that mains or battery voltage

is connected.

Unit annunciators

kHz, MHz, ms and ns.

## D. GENERAL CHARACTERISTICS

Oscillator

See Chapter VIII.

Supply

By mains

100 . . . 130 V or 200 . . . 260 V, 50 . . . 400 Hz max. 20 VA depending

on options.

By external battery

+ 11.5 to 28 V approximately 8 W.

By internal battery option

PM 9673

#### **Environmental characteristics**

Temperature

Operating

0° C . . . 50° C

 $0\,^{\circ}$  C . . .  $40\,^{\circ}$  C with battery option PM 9673. —40 $^{\circ}$  C . . . .  $70\,^{\circ}$  C

Storage

-40° C . . . 50° C with battery option PM 9673. Below CISPR (22/3, 29/2 and 40/1)

Mains interference

5000 m operating

Altitude

15000 m storage.

Shock Vibration Meets the requirements of the IEC 68 Eb recommendations. Meets the requirements of the IEC 68 F recommendations.

**Dimensions** 

Width Height 210 mm

Depth

89 mm 325 mm

Weight

Approximately 2.8 kg.

## III. ACCESSORIES

## Standard accessories supplied with the instrument

1 mains cable

1 manual

1 1.6 A fuse ,fast action

1 "115 V" label

#### Accessories to be ordered separately

2.1. Oscillators

PM 9677 Standard oscillator

PM 9678 TCXO

PM 9679 Oven-enclosed oscillator 1 × 10<sup>-7</sup>/month

PM 9690 Oven-enclosed oscillator 1.5 × 10<sup>-9</sup>/24 h.

2.2. Output interface units

PM 9674 BCD output unit

PM 9675 D/A converter

2.3. Input interface accessories

PM 9351 Passive measuring probe 10 M  $\Omega$  ,/11 pF

220 MHz, attenuation 10×

PM 9353 FET probe,  $1M\Omega/3.5F$ , 220 MHz

PM 9584 Resistive mixing piece, 50  $\Omega$ , 3 BNC sockets

PM 9346 Active-probe power supply

2.4. Coaxial cables

PM 9074 50  $\Omega$ , BNC to BNC,length1 m

PM 9588 Set of 50  $\Omega$  cables, BNC to BNC:

5 cables, length 20.7 cm 4 cables, length 40.5 cm 3 cables, length 60.3 cm

3 cables, length 198.6 cm

2.5. Mains cable

PM 9011 3-core detachable mains cable

2.6. Rack mount adapter

PM 9669 19" rack mount adapter

2.7. Battery unit

PM 9673 Internal battery unit

2.8. Carrying case

PM 9672 Carrying case for the instrument

## IV. INSTALLATION

## 1. Mains voltage conversion

The instrument can be converted into two mains voltage ranges 100—130 V and 200—260 V. The frequency range is 50 to 400 Hz. At delivery the instrument is set to the 200 to 260 V range.

When changing to the 100 to 130 V range the connections of the mains transformer should be changed as shown in figure IV-1, and the label "230 V" covered with the "115 V" label supplied.

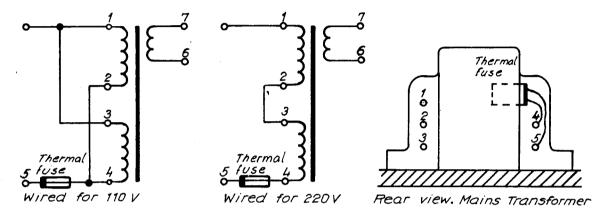


Figure IV-1. Mains transformer connections

## 2. Earthing

The local safety regulations prescribe how the instrument should be earthed. Two ways are possible:

- 1. Via the protective earth terminal at the rear panel.
- 2. Via the three core mains cable plugged into an outlet with protective earth contact.

NOTE: Use only one of these alternatives to avoid hum!

#### 3. Fuses

A thermal fuse on the mains transformer and a 1.6 A fuse, fast action, on unit U1 are protecting the power supply.

## 4. Optional accessories

Refer to installation instruction given in manual for each type number.

## V. CONTROLS, INDICATORS AND CONNECTORS

Front panel PM 6624 and PM 6625



## 1. Display time control

Potentiometer sets display time between 0.2 s and 5 s. Infinite display time when knob is pulled. With switch set to position STAND BY the counter is turned off except of the oven oscillator.

Warning: Primary voltage of power supply is on.

#### 2. kHz, MHz, ms and ns

Unit annunciators.

#### 3. Gate lamp

Indicates that main-gate is opened and counting takes place, in the stand-by position the gate lamp indicates that the line voltage or battery is connected for X-tal oscillator stabilization.

#### 4. Monitor socket channel A

Output socket for set trigger level.

#### 5. Trigger control channel A

Sets trigger level from  $-2.5\,\mathrm{V}$  to  $+2.5\,\mathrm{V}$  when the attenuator is in position 20mV, and from  $-25\,\mathrm{V}$  to  $+25\,\mathrm{V}$  when the attenuator is in position 200 mV. Knob pulled sets trigger level to 0 V.

#### 6. Trigger lamp channel A

Tri-state control lamp for set trigger level. Blinking lamp indicates that the set trigger level matches the level of the input signal. Lamp permanently on indicates that the set trigger level is too high, and lamp turned off indicates that set trigger level is too low.

## 7. Trigger lamp channel B

Same as trigger lamp channel A.

#### 8. Trigger control channel B

Same as trigger control channel A.

#### 9. Monitor socket channel B

Same as monitor socket channel A.

## 10. Memory

In released position the measurement information is stored until next measurement cycle is completed. Depressed button makes display follow decade counters continuously.

#### 11. Input C

Input socket for frequency and ratio measurement.

## 12. Start-Stop by B/Gated by B and Input A/Input C

In the upper position it sets counter to measure Count A Start-Stop by B, Frequency A, or Ratio A/B and in the lower position it sets counter to measure Count A Gated by B, Frequency C or Ratio C/B depending on how the Function Selector is set.

#### 13. Frequency A and C

Sets counter to measure frequency at inputs A and C. 100 Hz, 10 Hz, 1 Hz and 0.1 Hz correspond to the resolution of the least significant digit.

#### 14. Single

Sets counter to measure Single Period B or Single Time Interval A to B. Time resolution can be set to 0.1 ms or 0.1  $\mu$ s.

#### 15. Average

Sets counter to measure Multiple Period B or Time Interval Average A to B. 10<sup>2</sup>, 10<sup>4</sup> and 10<sup>6</sup> are number of averagings.

## 16. Ratio A/B or C/B

Combined with Input A/Input C switch it selects Ratio A/B or Ratio C/B measurement. 10<sup>4</sup> and 10<sup>6</sup> are multipliers.

#### 17. Count A

Sets counter to accumulate pulses between Start to Stop or Gated by B measurements.

#### 18. Function selector

Combined with the two slide switches it selects the different measuring modes.

#### 19. Period B/Time interval A to B

Sets counter to measure Period B or Time interval A to B.

#### 20. Self check

Connects 10 MHz from the internal oscillator to the input circuits of the counter.

#### 21. Slope selector channel A

Sets counter to trigger on either positive or negative slope of the input signal.

#### 22. Attenuator channel A

Provides 10 x attenuation of the input signal.

#### 23. AC/DC selector channel A

Selects AC or DC coupling of the input signal.

## 24. Separate/Common via B

Connects channel A and B internally in position COM VIA B. In position SEP the input channels are separated.

#### 25. AC/DC selector channel B

Same as AC/DC selector channel A.

#### 26. Attenuator channel B

Same as attenuator channel A.

#### 27. Slope selector channel B

Same as slope selector channel A.

#### 28. Input A

Input socket for frequency, ratio and time interval measurement.

## 29. Input B

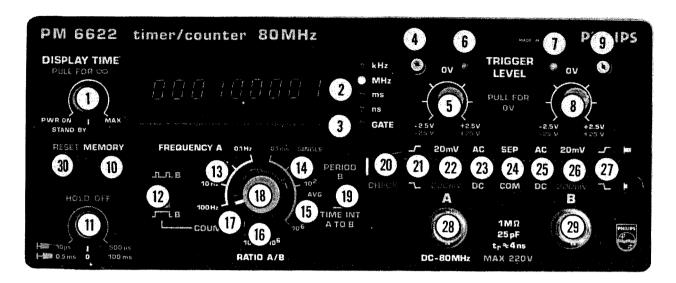
Input socket for period, ratio and time interval measurement.

## 30. Reset

Resets counter and display to zero.

# V. CONTROLS, INDICATORS AND CONNECTORS

Front panel PM 6622



#### 1. Display time control

Potentiometer sets display time between 0.2 s and 5 s. Infinite display time when knob is pulled. With switch set to position STAND BY the counter is turned off except of the oven oscillator.

Warning: Primary voltage of power supply is on.

## 2. kHz, MHz, ms and ns

Unit annunciators.

#### 3. Gate lamp

Indicates that main-gate is opened and counting takes place, in the stand-by position the gate lamp indicates that the line voltage or battery is connected for X-tal oscillator stabilization.

## 4. Monitor socket channel A

Output socket for set trigger level.

## 5. Trigger control channel A

Sets trigger level from  $-2.5\,\mathrm{V}$  to  $+2.5\,\mathrm{V}$  when the attenuator is in position 20mV, and from  $-25\,\mathrm{V}$  to  $+25\,\mathrm{V}$  when the attenuator is in position 200 mV. Knob pulled sets trigger level to 0 V.

#### 6. Trigger lamp channel A

Tri-state control lamp for set trigger level. Blinking lamp indicates that the set trigger level matches the level of the input signal. Lamp permanently on indicates that the set trigger level is too high, and lamp turned off indicates that set trigger level is too low.

## 7. Trigger lamp channel B

Same as trigger lamp channel A.

## 8. Trigger control channel B

Same as trigger control channel A.

#### 9. Monitor socket channel B

Same as monitor socket channel A.

## 10. Memory

In released position the measurement information is stored until next measurement cycle is completed. Depressed button makes display follow decade counters continuously.

#### 11. Hold off control

In Single Period and Single Time Interval this control disables retriggering of the main gate until the set hold off time is out.

## 12. Start/stop by B-Gated by B

In the upper position it sets counter to measure Count A Start-Stop by B, in the lower position counter will measure Count A Gated by B.

## 13. Frequency A

Sets counter to measure frequency at input A. 100 Hz, 10 Hz, 1 Hz and 0.1 Hz correspond to the resolution  $_{0}\mathbf{f}$  the least significant digit.

#### 14. Single

Sets counter to measure Single Period B or Single Time Interval A to B. Time resolution can be set  $t_{2}$  0.1 ms or 0.1  $\mu$ s.

## 15. Average

Sets counter to measure Multiple Period B or Time Interval Average A to B. 10<sup>2</sup>, 10<sup>4</sup> and 10<sup>6</sup> are number of averagings.

#### 16. Ratio A/B

Sets counter to measure ratio between signals at input A and B.  $10^4$  and  $10^6$  are multipliers.

#### 17. Count A

Sets counter to accumulate pulses between Start to Stop or Gated by B measurements.

#### 18. Function selector

Combined with the two slide switches it selects the different measuring modes.

#### 19. Period B/Time interval A to B

Sets counter to measure Period B or Time interval A to B.

#### 20. Self check

Connects 10 MHz from the internal oscillator to the input circuits of the counter.

## 21. Slope selector channel A

Sets counter to trigger on either positive or negative slope of the input signal.

#### 22. Attenuator channel A

Provides 10 x attenuation of the input signal.

#### 23. AC/DC selector channel A

Selects AC or DC coupling of the input signal.

## 24. Separate/Common via B

Connects channel A and B internally in position COM VIA B. In position SEP the input channels are separated.

#### 25. AC/DC selector channel B

Same as AC/DC selector channel A.

#### 26. Attenuator channel B

Same as attenuator channel A.

## 27. Slope selector channel B

Same as slope selector channel A.

#### 28. Input A

Input socket for frequency, ratio and time interval measurement.

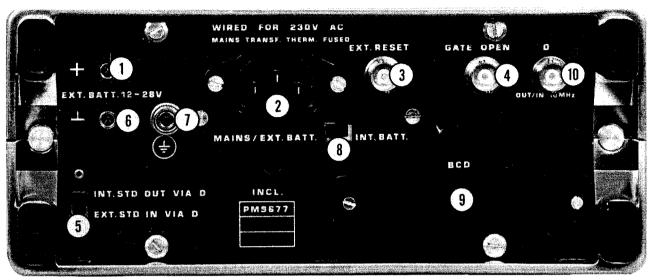
#### 29. Input B

Input socket for period, ratio and time interval measurement.

#### 30. Reset

Resets counter and display to zero.

## Rear panel PM 6622 . . . 25



## 1. External battery socket

Plus pole input socket for external battery.

## 2. Mains input

Input socket for the mains.

## 3. External reset input

Input socket for reset/start signal.

## 4. Monitor socket gate signal

Output socket for gate and hold off (PM 6622) signals.

## 5. Internal/External Standard switch

Sets operating mode of input D to either internal 10 MHz out or external 10 MHz in.

#### 6. External battery socket

Minus pole input socket for external battery.

#### 7. Chassis ground

Protective earth terminal.

## 8. Mains/Battery switch

Sets power supply to be fed from external or internal power source.

## 9. BCD and D/A connector

Output connector for the BCD and D/A units.

## 10. Internal/External Standard socket

10 MHz out or external 10 MHz in.

# Top view PM 6622 . . . 25

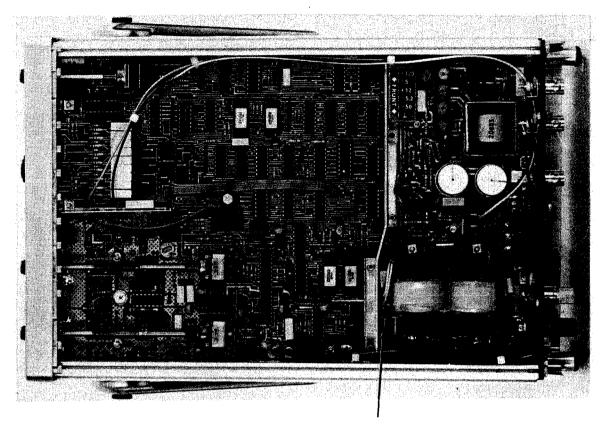
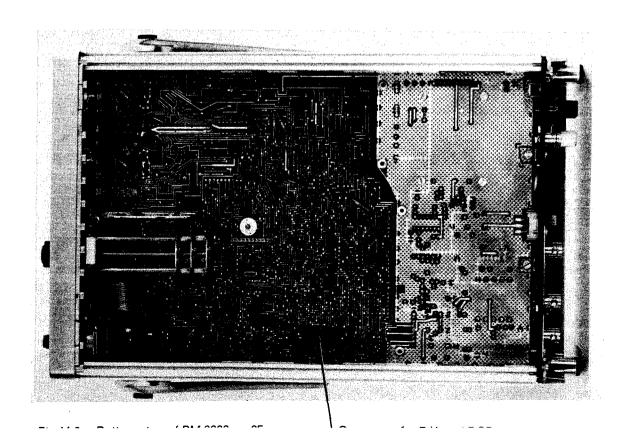


Fig. V-1. Top view of PM 6622 . . . 25

1.6 A fuse fast action.

## **Bottom view PM 6622...25**



## VI. OPERATION

#### General Information

## 1. Switch on power

#### 1.1. Mains

Before the counter is connected to the mains check that the mains transformer is wired for the local mains voltage as described in chapter IV.1. Mains voltage conversion

- Set switch MAINS EXT. BATT/INT. BATT on the rear panel to position MAINS EXT. BATT.
- Connect the mains cable to input socket for the mains at the rear panel.
- Set DISPLAY TIME control at the front panel to position ON.
- Check that display turns on indicating that power is on

#### 1.2. External battery

- Set switch MAINS EXT. BATT/INT. BATT at the rear panel to position MAINS EXT. BATT.
- Connect the cables from the external battery to sockets EXT. BATT. 12—28 V at the rear panel.
- Set DISPLAY TIME at the front panel control to position ON.
- Check that display turns on indicating that power is on.

#### 1.3. Internal battery PM 9675

- Set switch MAINS EXT. BATT/INT. BATT. at the rear panel to position INT. BATT.
- Set DISPLAY TIME control at the front panel to position ON.
- Check that display turns on indicating that power is on. Blinking display indicates low voltages.
   Refer to manual PM 9673 for charging instructions.

#### 2. Warm up time

The warm up time from the moment of mains connection is less than 7 minutes to an oscillator error of less than  $10^{-7}$  for instruments equipped with the ovenenclosed oscillators PM 9679 and PM 9690. Instruments equipped with the oscillators PM 9677 or PM 9678 (TCXO) are ready for use at the moment of mains connection.

Normally the instrument is switched on from the STAND BY position. If so, no warm up time is needed, irrespective of which oscillator is employed.

## 3. External frequency standards

House standards or other frequency standards can be used instead of the internal 10 MHz oscillator.

If a time resolution of 100 ns is required, 10 MHz must be used. When using 1 MHz instead of 10 MHz the decimal point must be shifted one step to the left to interpret the display correctly. To set the counter to external standard the switch EXT. STD OUT VIA D/EXT. STD IN VIA D at the rear panel must be set to position EXT. STD IN VIA D.

#### 4. Control settings

#### 4.1. A, B and C inputs

The A and B amplifiers are identical in specification and provided with identical input controls.

The A input is normally used for frequency measurement and the B input for time measurement.

The C input is a prescaler input with automatic PINdiode attenuator and mainly used for high frequency measurement.

#### 4.2. AC and DC coupling

The AC/DC push-button controls the coupling of the input signal to the attenuator and the amplifier by switching a capacitor in series in the AC mode and by direct coupling in the DC mode.

A.C. coupling is normally used to block the d.c. component in signals which are superimposed on a d.c. voltage. The capacitor in series will, however, cause a falling sensitivity for low frequencies.

In waveforms where pulse width and repetition time vary the d.c. level will also vary. Change in the d.c. level will cause changes in the preset triggering level and make accurate time measurements impossible if A.C. coupled, in such cases the input should be D.C. coupled.

Normally frequency measurements are performed with an A.C. coupled input and time interval measurements with a D.C. coupled input.

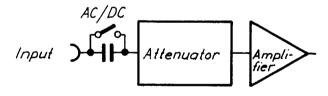


Fig. VI-1. AC/DC coupling

#### 4.3. Attenuator and Trigger Level.

The TRIGGER LEVEL control allows continuous setting of the trigger level at any point of the input signal. For high amplitude signals the attenuator is used to expand the setting range.

However, input attenuation will decrease the sensitivity and cause bigger trigger errors.

For frequency measurements on sine wave and other symmetrical signals no level off-set is required. Pulled position of the TRIGGER LEVEL control sets the trigger level to 0 V for highest sensitivity.

However, for frequency measurement on narrow pulses a limited off-set voltage may be needed to obtain reliable triggering.

Time measurement requires continuously variable setting of the trigger level.

Monitor sockets for channel A and B provide  $t_{\parallel}e$  ability to measure the set trigger level.

If the attenuator is set to 200 mV the trigger level range is increased 10 times from  $\pm 2.5$  V to  $\pm 25$  V.

The name trigger level can be misleading, since triggering does not occur on the set trigger level but at the trigger point—see figure VI-2.

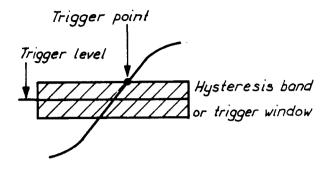


Fig. VI-2. Triggering

## 4.4. Separate and Common via B mode

In the SEP position the A and B inputs operate independently of each other in any operations irrespective of input sources. In the COM position the A input is disconnected from its attenuator and amplifier, and a signal connected to input B is coupled to both A and B attenuators and amplifiers.

All input specifications of input B will remain the same but the input impedance will be 500 k $\Omega$  shunted by 50 pF.

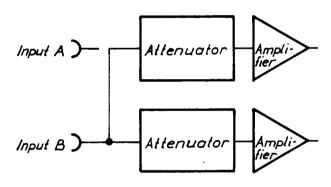


Fig. VI-3. COM via B mode

#### 4.5. Positive and negative slope triggering

This push-button determines on which slope of the input signal the triggering will occur.

In released position the triggering will occur at the positive slope of the input signal and in depressed position it will occur on the negative slope.

Where on the slope the triggering will occur is determined by the TRIGGER LEVEL control.

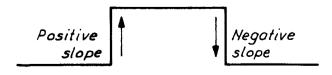


Fig. VI-4. Positive and negative slope triggering

A simple way to measure the pulse width of a positive pulse is achieved by setting input A to positive slope and input B to negative slope, connect the pulse to input B, set FUNCTION SELECTOR to any of the two SINGLE positions, slide switch PERIOD B/TIME INT. A TO B to position TIME INT. A TO B and SEP/COM to COM.

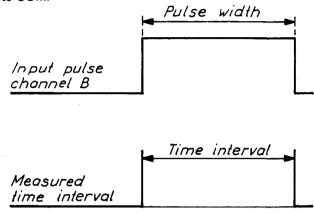


Fig. VI-5. Simple pulse width measurement

#### 4.6. Hold off PM 6622

This control provides a delayed triggering of the instrument in single period and time interval measurement, this feature is used to avoid false triggering on noisy signals.

## 5. Basic measurements

## 5.1. CHECK PM 6622



Self check of the instrument.

- Depress CHECK push-button
- Rotate FUNCTION SELECTOR and read:

## Frequency A

100 Hz 00010.0000 10 Hz 0010.00000 1 Hz 010.000000 0.1 Hz 10.0000000 Set PERIOD B/TIME INT A TO B to PERIOD B

## Period B

0.1 ms	0.0000000.0
0.1 ns	00000.0001
10 <sup>2</sup>	000000100
104	0000100.00
106	00100.0000

## Ratio A/B

106	001.000000
104	00001.0000

## Count A

Start/Stop	000000002
Gated	000000001

## 5.2. CHECK PM 6624 . . . 25



Self check of the instrument.

- Depress CHECK push-button
- Set INPUT A/INPUT C to INPUT A
- Rotate FUNCTION SELECTOR and read:

## FREQUENCY A

100 Hz	00010.0000 MHz
10 Hz	0010.00000 MHz
1 Hz	010000.000 kHz
0.1 Hz	10000.0000 kHz

## Set PERIOD B/TIME INT A TO B to PERIOD B

## PERIOD B

0.1 ms	0.0000000.0
0.1 ns	00000.0001
10 <sup>2</sup>	000000100
104	0000100.00
106	00100.0000

## RATIO A/B

106	001.000000
104	00001.0000

## Set INPUT A/INPUT C to INPUT C

## RATIO C/B PM 6624

104	000000.800
106	00008.0000

## RATIO C/B PM 6625

104	016.000000
106	00016.0000

## COUNT A

Start/Stop	000000002
Gated	000000001

## FREQUENCY C PM 6624

100 Hz	00080.0000 MH:
10 Hz	0080.00000 MH:
1 Hz	080000.000 kHz
0.1 Hz	80000.0000 kHz

# FREQUENCY C PM 6625

100 Hz	00160.0000 MHz
10 Hz	0160.00000 MHz
1 Hz	160000.000 kHz
0.1 Hz	60000 0000 kHz

## 5.3. Frequency A. PM 6622 . . . 25

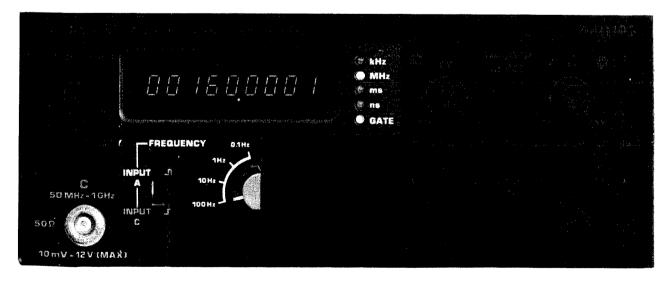


Simple frequency measurement on sine waves and other symmetrical waveforms.

- Set FUNCTION SELECTOR to desired resolution
- Set INPUT A/INPUT C to INPUT A (only PM 6624 ... 25)
- Set AC/DC to AC

- Pull TRIGGER LEVEL control
- Set SEP/COM to SEP
- Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1  $V_{\rm rms}$
- Connect the input signal to input A
   Display will show frequency in kHz or MHz

## 5.4. FREQUENCY C PM 6624 . . . 25

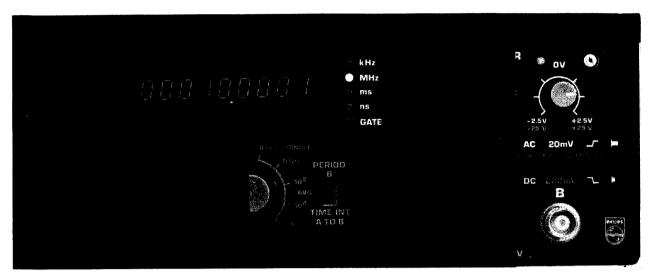


Automatic frequency measurement.

- Set FUNCTION SELECTOR to desired resolution
- Set INPUT A/INPUT C to INPUT C

Connect the input signal to input C
 Display will show frequency in MHz or kHz

## 5.5. PERIOD B PM 6622 . . . 25



Simple period measurement on sine waves and other symmetrical waveforms.

- Set FUNCTION SELECTOR to SINGLE or AVG measurement
- Set PERIOD B/TIME INT A TO B to PERIOD B
- Pull TRIGGER LEVEL

- Set AC/DC to AC
- Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1  $V_{\rm rms}$
- Select positive slope triggering
- Connect the signal to input B
   Display will show period time in ms or ns

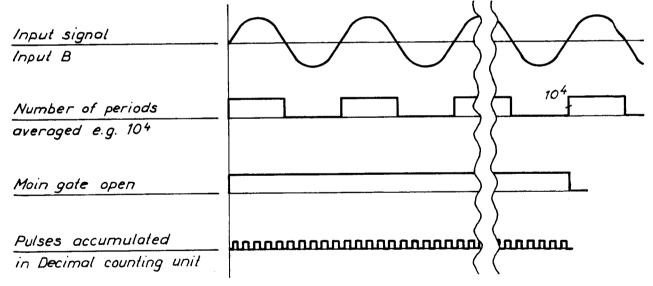


Fig. VI-6. Period average measurement

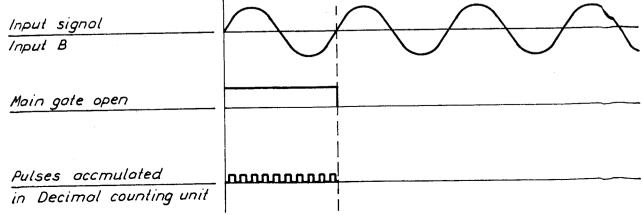


Fig. VI-7. Single period measurement

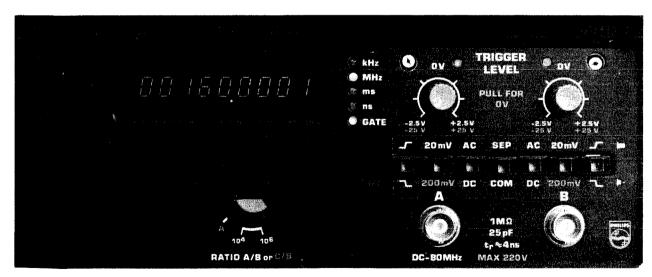
## 5.6. Time Interval A to B PM 6622 . . . 25



Simple measurement of time interval between pulses at input A and B from separate sources.

- Set FUNCTION SELECTOR to SINGLE or AVG
- Set PERIOD B/TIME INT A TO B to TIME INT A TO B
- Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 3 V<sub>p-p</sub>
- Set AC/DC to DC
- Set SEP/COM to SEP
- Select positive slope triggering
- Set TRIGGER LEVEL potentiometer to suitable trigger level e.g. 50 % of the pulse amplitude
- Connect the pulses to input A and B
   Display will show the time interval in ms or ns

## 5.7. Ratio A/B PM 6622 . . . 25



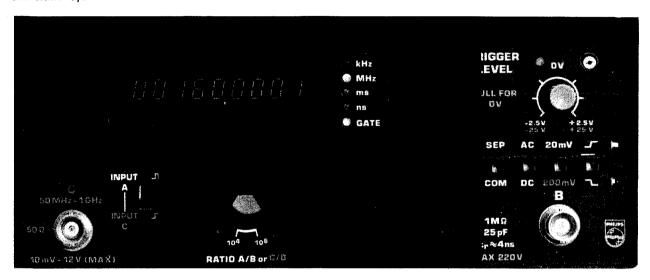
Simple ratio measurement on sine wave or other symmetrical waveforms.

- Set FUNCTION SELECTOR to 10<sup>4</sup> or 10<sup>6</sup>
- Pull TRIGGER LEVEL control
- Set AC/DC to AC
- Set SEP/COM to SEP

- Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1 V<sub>rms</sub>
- Connect the signal with the highest frequency to input A and the other signal to input B

Display will show the ratio of the signal frequencies at input A and B

## 5.8. Ratio C/B PM 6624...25



Simple ratio measurement on sine wave and other symmetrical waveforms.

- Set FUNCTION SELECTOR to 10<sup>4</sup> or 10<sup>6</sup>
- Set INPUT A/INPUT C to INPUT C
- Pull TRIGGER LEVEL control
- Set SEP/COM to SEP

- Set AC/DC to AC
- Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1  $V_{\rm rms}$
- Connect the signal with the highest frequency to input C and the other to input B
  - Display will show the ratio of the signal frequencies at input  $\boldsymbol{C}$  and  $\boldsymbol{B}$

#### 5.9. Count A Start/Stop and Gated by B. PM 6622 . . . 25



Simple Start/Stop and Gated by B measurement on sine wave and other symmetrical waveforms.

- Set FUNCTION SELECTOR to COUNT A
- Pull TRIGGER LEVEL Control
- Set AC/DC to AC for channel A
- Set AC/DC to DC for channel B
- Set SEP/COM to SEP
- Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1 V<sub>rms</sub>

- Select positive slope triggering
- Select Start/Stop by B (upper position) or Gated by B (lower position)
- Connect gating signal to input B and the other signal to input A

In Start/Stop operation the display will show the accumulated number of counts in the time interval between the Start/Stop signals, and in the Gated mode the accumulated number of counts during the positive and negative slopes of the Gating signal

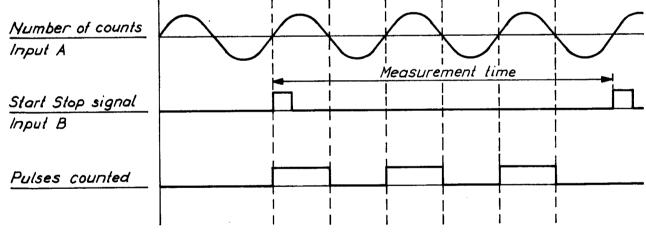


Fig. VI-8. Start/Stop by B measurement

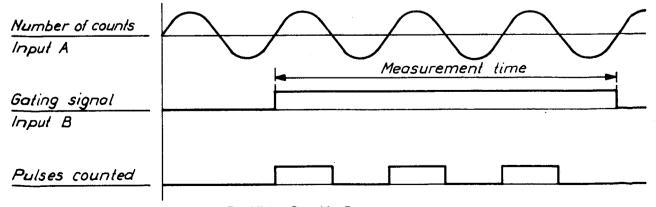
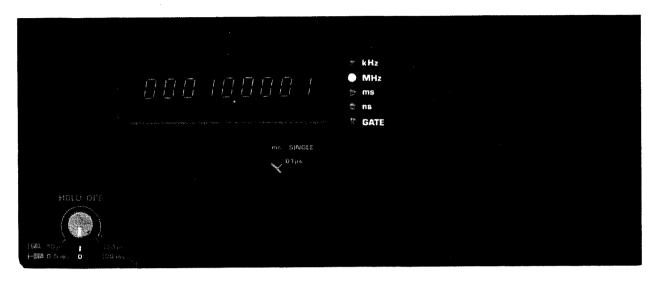


Fig. VI-9. Gated by B measurement

## 5.10. Hold off PM 6622



- Set FUNCTION SELECTOR to 0.1 μs and rotate HOLD OFF control from fully CCW to fully CW position
- Read hold off time from 0.01 to 0.5 ms on the display with knob pushed and 0.5 ms to 100 ms with knob pulled

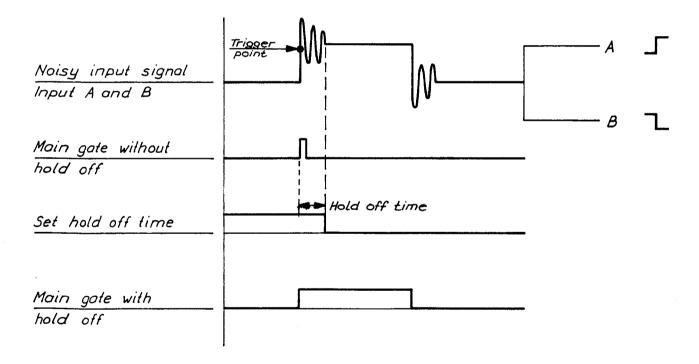


Fig. VI-10. Time interval measurement on noisy signals

## VII. INTERNAL CHECKS AND ADJUSTMENTS

The tolerances mentioned in the following text apply to newly adjusted instruments only. The value may differ from those given in Chapter II Technical data.

Note: Always check the d.c. supply voltages before any adjustments are made.

#### 1. Use figure X-2 to identify the location of trimmers and check points.

#### 2. Test equipment

Check point	Instrument	Required data	Recommended model
3	Voltmeter	5—150 V d.c.	Philips PM 2412
4 6	Voltmeter	1 V d.c.	Philips PM 2412
5 8	Pulsegenerator	Frequency 10 kHz Amplitude 1 V Duty factor 0.5	Philips PM 5715 or PM 5705
5 8	Oscilloscope	Low frequency	Philips PM 3250
5 8	Probe	Passive 10 M $\Omega/$ 11 pF	Philips PM 9336

#### 3. D.C. voltages

3.1 Connect the voltmeter to jumper connector BU 104 and check the d.c. voltages according to table below.

Test point	Measured voltage
+120	115 130 V
+5.2	4.8 5.2 V
+12	11.5 13 V
<b></b> 5.2	55.4 V
50	5060 V

#### 4. D.C. balance channel A.

4.1 Disconnect all input signals, release all push-buttons and set the controls of the counter:

Start/Stop

upper position

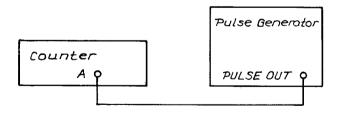
Trigg. level pot.

pulled

4.2 Connect the voltmeter to terminal 6 of IC 101 and adjust R 1104 until voltmeter shows 0 V.

#### 5. Frequency compensation channel A

Test set up.



5.1 Set the controls of the counter:

Attenuator

200 mV position

5.2 Set the controls of the pulse generator:

5.3 Connect the oscilloscope via a well adjusted 10  $M\Omega/11$  pF probe to terminal 6 of IC 101 and adjust C 102 to minimum distortion of the dispayed waveform.

#### 6. D.C. balance channel B

6.1 Disconnect all input signals, release all push-buttons and set the controls of the counter:

Start/Stop

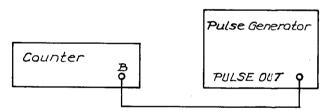
upper position pulled.

Trigg.level pot.

6.2 Connect the voltmeter to terminal 12 of IC 101 and adjust R 1044 until voltmeter shows zero.

#### 7. Frequency compensation channel B

Test set up.



7.1 Set the controls of the counter:

Attenuator

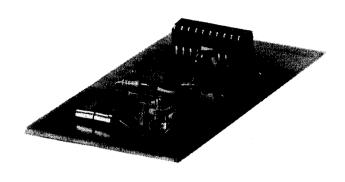
200 mV position

7.2 Set the controls of the pulse generator:

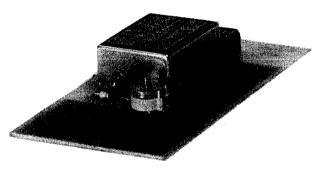
 $\begin{array}{lll} \text{Frequency} & \text{10 kHz} \\ \text{Amplitude} & \text{3 $V_{p\text{-}p}$} \\ \text{Duty factor} & \text{0.5} \end{array}$ 

7.3 Connect the oscilloscope via a well a djusted 10 M $\Omega$ /11 pF probe to terminal 12 of IC 101 and adjust C 112 to minimum distortion of the displayed wave form.

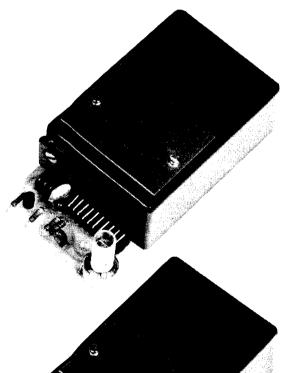
# VIII. OSCILLATORS PM 9677, PM 9678, PM 9679 and PM 9690



PM 9677 9446 096 770.1



PM 9678 9446 096 780.1



PM 9679



## 1. General

The oscillators are made as plug-in cards and have a nominal frequency of 10 MHz.

2. Technical data				
2.1. Electrical	PM 9677	PM 9678	PM 9679	PM 9690
Nominal frequency, MHz	10.000 000	10.000 000	10.000 000	10.000 000
Trimming range, Hz	> ± 200	> ± 20	+ 20*) 30	+3*) —7
Output voltage, mV (into 1 kohm)	> 300	> 100	> 150	> 50
Supply voltage, V	+ 12	+ 12	+ 11.5 to 28 (from unre- gulated power supply)	+ 11.5 to 28 (from unregulated power supply)
Power consumption (+25°C) Continuous operation Stand by Warm up	< 100 mW none none	< 200 mW none none	< 100 mA < 100 mA < 400 mA	< 125 mA < 125 mA < 400 mA
Stability against: Ageing	$< 5 \times 10^{-7}$ /month	< 1 × 10 <sup>-7</sup> /month**)	$< 1 \times 10^{-7}$ /month	< 1.5×10 <sup>-9</sup> /24 h (after 72 hours of continuous opera- tion)
Temperature 0 50°C (ref. to +25°C)	< 1 × 10 <sup>-5</sup>	<1×10 <sup>-6</sup>	< 1 × 10 <sup>-7</sup>	< 3×10 <sup>-8</sup>
Line voltage $\pm$ 10 %	$< 1 \times 10^{-8}$	< 1 × 10 <sup>-9</sup>	< 1 × 10 <sup>-9</sup>	$< 5 \times 10^{-10}$
Change of measuring mode and change between line, ext. and int. battery	< 3×10 <sup>-7</sup>	< 5×10 <sup>-8</sup>	< 1×10 <sup>-8</sup>	<3×10 <sup>-9</sup>
Warm up time (to reach $1 \times 10^{-7}$ )			< 10 min	< 15 min
2.2. Environmental				
Temperature Storage, °C Operating, °C	-40 to +70 0 to +50	40 to +70 0 to +50	40 to +70 0 to +50	—40 to +70 0 to +50
Altitude Storage, m Operating, m	15000 5000	15000 5000	15000 5000	15000 5000
Humidity at 50°C	10—90 % RH (26° dew point)	10—90 % RH (26° dew point)	10—90 % RH (26° dew point)	10—90 % (26° dew point)
Shock	Meets the rea	quirement of the IEC	Eb recommendation	ons all oscillators
Vibration	Meets the red	quirement of the IEC (	88F recommendation	
2.3. Mechanical				,
Dimensions, mm	93×50×20	93×50×15	$100 \times 52 \times 35$	100×52×35
Weight, g	50	25	100	100

 $<sup>^*</sup>$ ) The indicated values regard only the fine trimming range. A coarse trimmer is available on the PM 9679 and PM 9690 to adjust for an ageing of more than 10 years.

<sup>\*\*)</sup> Trimming range will cover at least 10 years of operation since the ageing will decrease substantially after the first 6 months.

## 3. Frequency adjustment PM 9677

3.1. This adjustment requires a reference oscillator having an accuracy of  $\leq 1 \times 10^{-6}$ .

The oven enclosed PHILIPS oscillators PM 9680\*, PM 9681\* and PM 9690\* meet this requirement.

The adjustment should preferably be made at an ambient temperature of +25 °C.

3.2. Remove the bottom cover of the counter.

3.3. Connect the reference signal available at socket 10 MHz OUT of the external counter to INPUT A of the counter to be adjusted.

3.4. Set the controls of the counter to be adjusted: FUNCTION SELECTOR: FREQUENCY A 1 Hz TRIGGER LEVEL A: pulled

3.5. Adjust trimming capacitor C 1 to 10000.000 kHz plus or minus 10 Hz.

#### 4. Frequency adjustment PM 9678

4.1. This adjustment requires a reference oscillator having an accuracy of  $\leq 1 \times 10^{-7}$ .

The oven enclosed PHILIPS oscillator PM 9680\*, PM 9681\* and PM 9690\* meet this requirement.

The adjustment should preferably be made at an ambient temperature of +25°C.

4.2. Remove the bottom cover of the counter.

4.3. Connect the reference signal available at socket 10 MHz OUT of the external counter to INPUT A of the counter to be adjusted.

4.4. Set the controls of the counter to be adjusted: FUNCTION SELECTOR: FREQUENCY A 1 Hz TRIGGER LEVEL: pulled

4.5. Adjust trimming capacitor C 1 to 10000.000 kHz plus or minus 1 Hz.

4.6. Set FUNCTION SELECTOR to position 0.1 Hz and check that display read out is the same as before. If not, adjust C1 slightly to correct frequency.

## 5. Frequency adjustment PM 9679

5.1. This adjustment requires a reference oscillator having an accuracy of  $\leq 3 \times 10^{-8}$ .

The oven enclosed PHILIPS oscillators PM 9680\*, PM 9681\* and PM 9690\* meet this requirement.

The adjustment should preferably be made at an ambient temperature of 25°C and the oscillator must have been operating continuously 72 h before any adjustment is made.

5.2. Remove the bottom cover of the counter.

5.3. Connect the reference signal available at socket 10 MHz OUT of the external counter to socket EXT. TRIGG of oscilloscope PHILIPS PM 3250 or PM 3400. 5.4. Connect the oscillator signal available at socket

5.4. Connect the oscillator signal available at socket 10 MHz OUT of the counter to be adjusted to INPUT A of the oscilloscope.

5.5. Set oscilloscope to 100 ns/div and adjust trimming potentiometer R 208 until waveform moves with a velocity of maximum 1 div./3 s (0.3 Hz).

If the adjustment range of R 208 is too narrow perform the following steps 5.6 to 5.12.

5.6. Set trimming potentiometer R 208 to fully clockwise position.

5.7. Remove the two screws fixing the oscillator's text plate to the box.

5.8. Remove the small plastic cylinder beneath the text plate using a pair of tweezers.

5.9. Connect an external counter to socket 10 MHz OUT at the rear panel of the counter to be adjusted.

5.10. Adjust trimming capacitor C 108 until the display

read out of the external counter is 10000020 Hz.

5.11. Refit the plastic cylinder and the text plate.

5.12. Perform steps 5.3 to 5.5.

#### 6. Frequency adjustment PM 9690

6.1. This adjustment requires a reference frequency having an accuracy of  $\leq 1 \times 10^{-9}$ .

Hewlett-Packard quartz frequency standard HP 105\* meets this requirement.

The adjustment should preferably be made at an ambient temperature of 25°C and the oscillator must have been operating continuously 72 h before any adjustment is made.

6.2. Remove the bottom cover of the counter.

6.3. Connect any of the three reference signals available at sockets 5 MHz, 1 MHz and 100 kHz of the HP 105 to socket EXT. TRIGG of oscilloscope PHILIPS PM 3250 or PM 3400.

6.4. Connect the oscillator signal available at socket 10 MHz OUT of the counter to be adjusted to INPUT A of the oscilloscope.

6.5. Set oscilloscope to 100 ns/div and adjust trimming potentiometer R 208 until waveform moves with a velocity of maximum 1 div/10 s (0.1 Hz).

If the adjustment range of R 208 is too narrow perform the following steps 6.6 to 6.12.

6.6. Set trimming potentiometer R 208 to fully clockwise position.

6.7. Remove the two screws fixing the oscillator's text plate to the box.

6.8. Remove the small plastic cylinder beneath the text plate using a pair of tweezers.

6.9. Connect an external counter to socket 10 MHz OUT at the rear panel of the counter to be adjusted.

6.10. Adjust trimming capacitor C 108 until the display read out of the external counter is 10000003 Hz.

6.11. Refit the plastic cylinder and the text plate.

6.12. Perform steps 6.3 to 6.5.

## 7. Repair of oscillator PM 9679 and PM 9690

7.1. Repair of these oscillators may not be carried out by the local service organisations. In case of breakdown the complete sealed oscillator box has to be sent to the factory for repair.

Factory address:

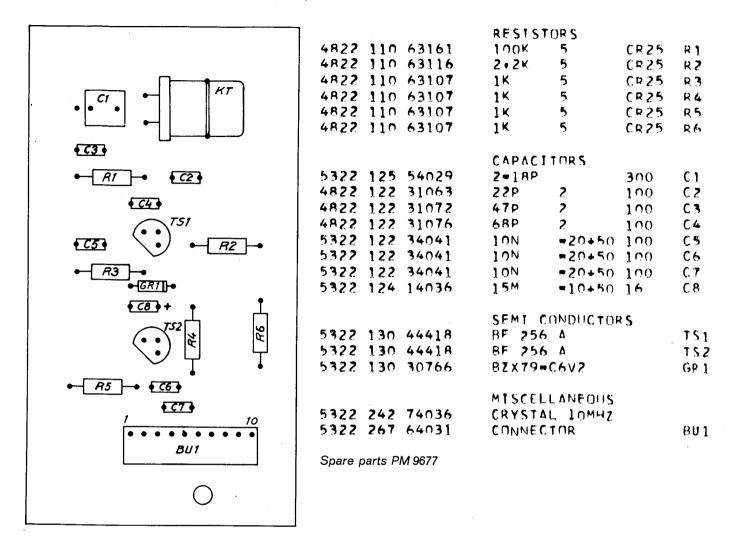
PHILIPS ELEKTRONIKINDUSTRIER AB INDUSTRIAL OPERATIONS FACK S-175 20 JÄRFÄLLA SWEDEN

#### 8. Pin configuration

Pir		P <b>M</b> 9678	PM 9679	PM 9690
1	<u>_</u>			
2	1			
3				
4			+ 11.5 to 28	V +1 1.5 to 28 V
5	10 MHz out	10 MHz or	ut 10 MHz out	1) MHz out
7	+ 12 V	+ 12 V		

<sup>\*</sup>To be checked against a frequency stanta rd such as Droitwich or HBG.

## 9. Circuit diagram, component lay-out and spare parts list PM 9677



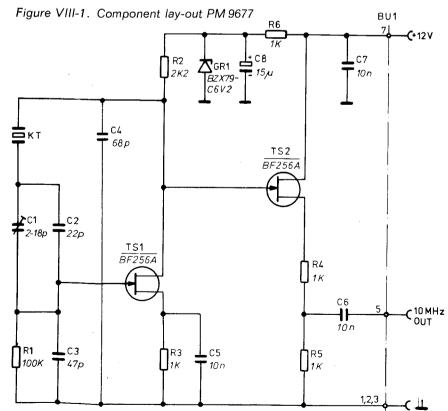


Figure VIII-2. Circuit diagram PM 9677

# 10. Circuit diagram, component lay-out and spare parts list PM 9678

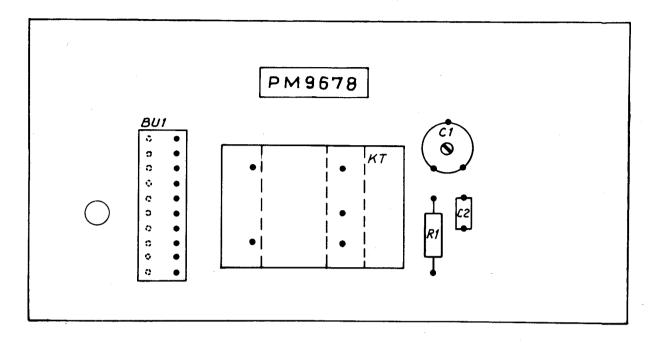


Figure VIII-3. Component lay-out PM 9678

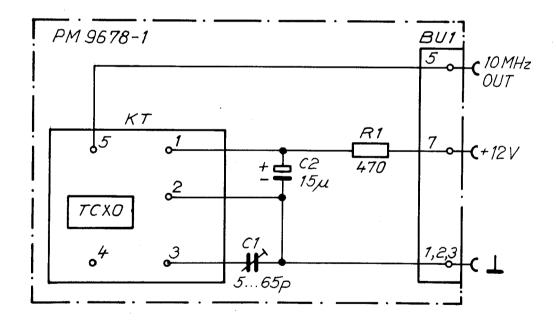


Figure VIII-4. Circuit diagram PM 9678

## ORDERING NUMBER

4822 110 63098	470 Ω 5%	R 1
5322 125 50057	5-65P 100 V	C 1
5322 124 14036	15 M -10 +50 % 16 V	C 2
5322 267 64031	Connector	BU 1
5322 216 94047	Crystal 10 MHz	

## IX. REPLACING PARTS

#### 1. Push-button switches

1.1. Loosen switch by bending the four tags securing the switch to the switch bracket.

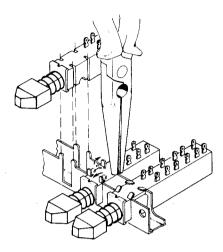


Fig. IX-1. Replacing push-button switch

- 1.2. Crush the switch by means of a pair of cutting pliers.
- 1.3. Unsolder the contact pins from the circuit board one by one. Use a sucking device to remove all tin solder from the contact holes in the circuit board before attaching the new switch.

#### 2. Text plate and front rim

- 2.1. Remove the knobs for DISPLAY TIME, HOLD OFF (PM 6622), TRIGGER LEVEL and function selector.
- 2.2. Put a screw driver between the front rim and the front frame at points  $\boldsymbol{A}_{\:\raisebox{1pt}{\text{\circle*{1.5}}}}$

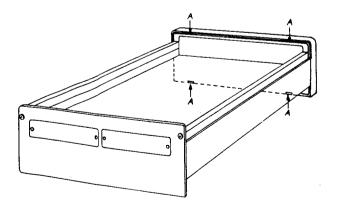


Fig. IX-2. Removing the front rim

- 2.3. Pry gently until front rim comes off.
- 2.4. Remove the text plate.

#### 3. Handle

- 3.1. Remove the two plastic caps using a tiny screw driver or a pair of pliers.
- 3.2. Unscrew the two screws and pull out handle.
- 3.3. Before assambling grease, the tooth washer screwhole and teeth of the handle very slightly with vaseline.

#### 4. Power supply

When replacing parts in the power supply, in particular IC150, always check the  $\pm 5.0 \text{ V}$  supply.

#### Proceed as follows:

- 4.1. Connect a voltmeter to BU107 pin  $+5.2\,V$  and check that the voltage is 4.8—5.2 V If the measured voltage does not reach 4.8—5.2 V unsolder R 1103 and select a resistor value that gives the desired voltage. The value of this resistor may be 1 k $\Omega$  to 33 k $\Omega$ . Typical value is 8 k $\Omega$ .
- 4.2. Check the d.c. voltages, refer to chapter VII section 3.

# X. SPARE PARTS, CIRCUIT DESCRIPTION OF POWER SUPPLY AND PRESCALER UNITS, TEST CONDITIONS AND CIRCUIT DIAGRAMS

UNIT U1 ALL MODELS

FIXED CAPACITORS			VARIABLE CAPACITO		
Ordering number Fa	rad Tol.(%) Volt:	s item	Ordering number	Farad Volt	s Item
4822 121 40407 22N 4822 122 31076 68P		C101 C103	5322 125 54024 5322 125 54024	2-9P 300 2-9P 300	
4822 122 31168 270		C104	3366 163 34064	2-7/	0112
4822 122 31072 47P	2 100	C105			
5322 122 34041 10N		C106	UNIT UI ALL MODEL	.\$	
5322 121 40323 100 5322 124 14053 33M		C107 C108	INTEGRATED CIRCUI		
4822 121 40407 22N		Cili	Ordering number	Түре	<u>Item</u>
4822 122 31076 68P		C113			
4822 122 31168 270		C114	5322 209 85408 5322 209 84643	MC1651L	10101
4822 122 31072 47P 5322 122 34041 10N		C115 C116	5322 209 85409	MC10102P GXB10110	1C102 1C103
5322 121 40323 100		Č117	5322 209 84825	MC10216P	10104
5322 124 14053 33M	-	C118	5322 209 84183	SN74S74N SN74S74N	10125
4822 122 31081 100 5322 124 14053 33M		C119 C121	5322 209 84183 5322 209 84304		10126 10127
5322 122 34041 10N		C122	5322 209 85406	SN75107AN N74LS54A N7403A SN7400N	10128
5322 124 14053 33M	=10+50.10	C123	5322 209 84628	N7403A	10129
5322 122 34041 10N 5322 122 34041 10N		C124 C125	5322 209 84528	SN7400N	10130
5322 122 34041 10N 5322 122 34041 10N		C125	5322 209 84722 5322 209 84722	GZF1201P MOS	10131
5322 122 34041 10N		C127	5322 209 85001	5N7400N GZF1201P MOS GZF1201P MOS SN74LS157N SN74LS15NN	10133
5322 122 34041 10N		C128	5322 209 84996	SN74LS10N	1C134
5322 122 34041 10N 4822 121 40407 22N		C129 C130	5322 209 84183 5322 209 84724	SN74LS74N SN74S64N	10135 10136
4822 122 31036 2.2		C131	5322 209 85407	SN74LS19N SN74LS19N SN74LS74N SN74S64N N74S02A 723PC	10137
5322 122 34041 10N	-20+50 100	C132	5322 209 84655	723PC	10150
5322 124 14053 33M		C133	5322 209 85085 5322 209 84983	F34049PC SELECTED	
5322 124 14053 33M 5322 122 34041 10N		C134 C136	5322 209 85412	SN74LSOON CD4093BE MOS SN74LSOON	10152 10153
5322 122 34041 10N		C137	5322 209 84983	SN74LSOON	10154
4822 124 10197 47M		C139	5322 209 84655 5322 209 85085 5322 209 84983 5322 209 85412 5322 209 84983 5322 209 84993 5322 209 84993	\$N74L\$02N \$N74L\$02N F34001PC \$N74L\$00N	1C155
4822 124 10197 47M	• • • • •	C140	5322 209 84993 5322 209 84976	\$N74L\$02N	10156 10157
4822 121 40232 220 5322 122 34041 10N		C141 C144	5322 209 84983	SN74LSOON	10158
4822 122 30113 180		C146	5322 209 84984	SN74LS04N 82S90A	10159
5322 122 34041 10N		C147	5322 209 85411		10174
5322 122 34041 10N		C150	5322 209 80059 5322 209 84529	SN7475N SN7403N	10175 10176
4822 122 31081 100 4822 124 20534 680		C151 C152	5322 209 84722	GZF1201P MOS	10177
4822 121 40104 150		C153	5322 209 84722	GZF1201P MOS GZF1201P MOS SN7490AN	10178
4822 124 20586 150	M =10+50 16	C154	5322 209 80072 5322 209 80142	SN7490AN SN7442AN	10179
4822 124 20589 220 4822 124 20589 220		C155 C156	5322 209 84723	DM8884AN	1C180 1C181
4822 124 20589 220		C157	5322 111 94015	DM8884AN 6X1.0K 6X1.0K	10190
4822 124 20499 22M	-10+50 63	C160	5322 111 94015	6X1.0K	10191
4822 124 20534 680	<del>-</del>	C161	5322 111 94031 5322 111 94031	6X47K 6X47K	10192 10193
5322 122 34041 10N 5322 124 24116 1M		C162 C163	5322 111 94012	6X6.8K	10194
4822 122 31165 330		C164	5322 111 94012	6X6.8K	10195
5322 124 14075 1M	-10+50 25	C165	5322 111 94031 5322 111 94012	6X47K 6X6.8K	10196
5322 122 34041 10N		C166	5322 111 94026	6X470K	1019 <b>7</b> 10198
4822 121 40232 220 5322 124 14066 10M		C167 C168			
5322 122 34041 10N		C169		<u>.</u>	
4822 122 31081 100		C170	UNIT UI ALL MODEL TRANSISTORS	\$	
5322 121 40323 100 5322 121 40323 100		C172 C176	Ordering number	Type	140
4822 122 30114 2.2		C178	or deriving intimber	11 hc	Item
5322 122 34041 10N	-20+50 100	C179	5322 130 44578	E411 SILICONIX	T5101
4822 121 41156 68N		C180	5322 130 44578	E411 SILICONIX	TS102
5322 121 44137 68N 5322 121 44137 68N		C181 C182	5322 130 44435	2N5770	TS103
5322 121 44137 68N	10 250	C183	5322 130 44435 5322 130 44197	2N5770 BC558B	T\$104 T\$105
5322 121 44137 68N		C184	5322 130 44197	BC558B	TS105
5322 121 44137 68N 5322 121 44137 68N		C185 C186	5322 130 40407	2N2369	TS14Z
5322 121 44137 68N		C187	4822 130 40855	BC337	T\$146
5322. 121 44137 68N	1 10 250	C188	5322 130 24035 5322 130 40482	8T100A=02 BRY39	T\$150 T\$151
4822 121 40104 150	N 10 250	Ç189		J. 137	. 19496

UNIT U1 ALL MODELS

	4822 130 40855 5322 130 44417 5322 130 40482	BC337 BDX35 BRY39	TS152 TS153	UNIT UI ALL MODEL	S		
-	5322 130 44418	BF256A	T\$154 T\$155	Ordering number	Description	Item	Qty.
	4822 130 40937	BC548B	T\$156	5322 158 10289	INDUCTANCE 0.68MH	L101	_
	5322 130 44256	BC557	TS177	5322 158 10289	INDUCTANCE 0.68MH	L102	1
	5322 130 44247 5322 130 44247	85568 85568	TS180 TS181	5322 158 10243	INDUCTANCE 100MH	L103	ī
	5322 130 44247	85568	TS182	5322 158 10284	INDUCTANCE 47MH	L104	1
	5322 130 44247	85568	TS183	5322 158 10284 5322 158 10052	INDUCTANCE 47MH CHOKE	L105	1
	5322 130 44247	85568	T\$184	4822 526 10097	FXC BEAD	L150 L151	1
	5322 130 44247 5322 130 44247	B5\$68 B\$\$68	TS185 TS186	5322 158 10052	CHOKE	L152	i
	5322 130 44247	BS\$68	TS187				
	5322 130 44247	B\$\$68	T\$188	HALL HODEL	•		
				UNIT UI ALL MODEL MECHANICAL PARTS	3		
					Description	14.000	04.4
	UNIT UI ALL MODEL	S		Dracking Hamber	Description	1 ceni	Qty.
	DIODES			5322 256 34031	FUSEHOLDER	VL150	2
	Ordering number	Туре	<u>Item</u>	5322 255 44107	10 HOLDER 16 PINS	D.I.L	2
	5322 130 30392	BZY88-C3V3	GR101	5322 255 44112	1C HOLDER 18 PINS	D.I.L	5
	5322 130 30613	BAW62	GR102	5322 255 40089 5322 255 40089	TRANSISTOR HOLDER	TO 18-3	11
	5322 130 30613	BAW62	GR103	5322 265 54006	TRANSISTOR HOLDER TRANSISTOR HOLDER	TO 18-4 TS153	2 1
	5322 130 30392 5322 130 34563	BZY88+C3V3 BZX79+C2V7	GR104 GR105	5322 265 54006	FEMALE CONNECTOR	BU 102	i
	5322 130 30613	BAW62	GR106	5322 265 54018	MALE CONNECTOR	BU 102	i
	5322 130 34563	BZX79-C2V7	GR107	5322 265 44064 5322 265 44064	MALE CONNECTOR MALE CONNECTOR	BU103	1
	5322 130 30613	BAW62	GR108	5322 265 44064	MALE CONNECTOR	BU104 BU105	1
	5322 130 30392 5322 130 30613	BZY88-C3V3 BAW62	GR111 GR112	5322 255 44107	FEMALE CONNECTOR	BU106	î
	5322 130 30613	BAW62	GR113	5322 265 54006	FEMALE CONNECTOR	BU107	1
	5322 130 30392	BZY-C3V3	GR114	5322 101 94007 5322 101 94007	COMBINED SWITCH COMBINED SWITCH	SK101 SK102	1
	5322 130 34563 5322 130 30613	BZX79=CZV7	GR115	5322 276 14117	PUSH BUTTON SWITCH	SK102	1
	5322 130 34563	BAW62 BZX79+C2V7	GR116 GR117	5322 276 14117	PUSH BUTTON SWITCH	SK104	i
	5322 130 30613	BAW62	GR118	5322 273 74008	ROTARY SWITCH	SK105	1
	5322 130 30613	BAW62	GR121	5322 276 <b>1</b> 4117 5322 276 14117	PUSH BUTTON SWITCH PUSH BUTTON SWITCH	SK106 SK107	1
	5322 130 34047 5322 130 30613	BZX75-C1V4 BAW62	GR122 GR125	5322 276 14117	PUSH BUTTON SWITCH	SK108	i
	5322 130 30613	BAW62	GR138	5322 101 64017	COMBINED SWITCH	SK109	ĭ
	5322 130 30613	BAW62	GR139	5322 276 14117	PUSH BUTTON SWITCH	-	1
	5322 130 30613	BAW62	GR140	5322 276 14117 5322 276 14117	PUSH BUTTON SWITCH PUSH BUTTON SWITCH	•	1
	5322 130 30613	BAW62	GR141	5322 276 14117	PUSH BUTTON SWITCH	\$K117 \$K118	1
	5322 130 30613 5322 130 30613	BAW62 BAW62	GR142 GR143	5322 101 64017	COMBINED SWITCH	5K119	i
	5322 130 30613	BAW62	GR144	5322 276 14117	PUSH BUTTON SWITCH	\$K120	1
	5322 130 30613	BAW62	GR145	5322 277 24006	SLIDE SWITCH	\$K121	1
	5322 130 30774 5322 130 30594	BZX79-C10	GR151				
	5322 130 34401	BAV10 BZX70=C56	GR152 GR153	UNIT UI ALL MODELS			
	5322 130 30392	BZY88-C3V3	GR154	MISCELLANEOUS			
	4822 130 30868	BY210-600	GR155	Ordering number	Description	ıtem	Qtv.
	4822 130 30868 4822 130 30868	BY210-400 BY210-400	GR156 GR157	****			
	4822 130 30868	BY210-400	GR158	5322 146 14079 5322 142 64027	MAINS TRANSFORMER	T1 01	1
	4822 130 30868	BY210=400	GR159	4822 253 20022	DC-DC TRANSFORMER FUSE 1.6A FAST	T1 02 VL 150	1
	5322 130 30759 4822 130 30868	BZX79-C5V6	GR160	4822 252 20001	THERMAL FUSE	VL 101	i
	5322 130 30192	BY210-400 BY126	GR161 GR163	5322 131 94042	DISPLAY	B1 O1	1
	5322 130 30414	BY164	GR167	5322 462 34127	GUIDE RAIL	FOR U1	14
	5322 130 30613	BAW62	GR170				
	5322 130 34049 5322 130 30613	BZX75-C2V1 BAW62	GR171	FRONT PANEL ALL MI			
	5322 130 30613	BAW62	GR172 GR173	Ordering number	Description	item	aty.
	5322 130 30613	BAW62	GR175	<b>**</b>			
	5322 130 34189	BAW20	GR180		TEXT PLATE	PM6622	1
	5322 130 34189 5322 130 34189	BAW20 BAW20	GR181 GR182		TEXT PLATE	PM 624	1
	5322 130 34189	BAW20	GR183		TEXT PLATE WINDOW	PM6625	1
	5322 130 34189	84W20	GR184		FUNCTION KNOB	5K 105	1
	5322 130 34189 5322 130 34189	BAW20	GR185	5322 414 74019	COVER FUNCTION KNOB		1
	5322 130 34189 5322 130 34189	BAW20 BAW20	GR186 GR187	5322 414 34091	DISPLAY KNOB	\$K 101	1
	5322.130 34189	BAW20	GR188		COVER DISPLAY KNOB HOLD OFF KNOB	\$K <b>1</b> 01 \$K <b>4</b> 03	1
	5322 130 34166	BZX79-C51	GR189	5322 414 74015	COVER HOLD OFF KNOB		i
				5322 414 34091	TRIGGER KNOBS	•	2
					COVER TRIGGER KNOBS		2
					PUSH BUTTON KNOBS Input sockets a b	BUL BU2	10 2
				· · · · · · · · · · · · · · · · · · ·			_

REAR PANEL ALL			UNIT U2 PM6624				
Ordering number	r Description	Item	FIXED RESISTORS		_ , , , , ,		
			Ordering numbe	r Ohm	Tol.(%)	Type	Item
5322 267 34059	EXT BATTERY SOCKET		4822 116 51142	150	5	DD 27	0.201
5322 267 34059 5322 265 30066	EXT BATTERY SOCKET	BU22 BU23	5322 116 54396	68	5 5	PR37 PR52	R201 R202
5322 267 10004	INPUT D-10MHZ DUT	BU24	5322 116 54396	68	5	PR52	R203
5322 267 10004	EXT. RESET	BU25	5322 116 50417	162	5	MR25	R204
5322 267 10004	GATE OPEN	BU27	4822 111 30328	330	5	CR16	R205
5322 277 24017	INT EXT STD SHITCH	SK22	4822 110 63125	4.7K	5	CR25	R206
5322 121 44092	CAPACITOR 47NF 250V	/ C1	4822 110 63147	33K	5	CR25	R207
			4822 110 63107	1K	5	CR25	R208
CABINET ALL MOD	ELS		4822 110 63125 4822 110 63152	4.7K	5	CR25	R209
Ordering number	er Description	Item	4822 110 63107	47K 1K	5 5	CR25 CR25	R210 R211
<u></u>		•••	4822 110 42120	15K	5	CR25	R212
5322 498 54048	HANDLE ARM	2 1 2 2 1 1 1 1	4822 111 30067	33	5	CR16	R213
5322 498 54054	HANDLE PROFILE	ī	4822 110 63134	10K	5	CR25	R214
5322 520 34164	BEARING BUSH	Ž	4822 110 63141	18K	5	CR25	R215
5322 414 64053	CAP HANDLE ARM	2	4822 110 63101	560	5	CR25	R216
5322 447 84467 5322 447 84466	TOP COVER BOTJON COVER	1	4822 111 30264 4822 111 30323	2.7K	5 5	CR16	R217
5322 466 85335	FRONT ORNAMENT	<b>i</b>	4822 111 30272	270 680	5	CR16 CR16	R218 R219
5322 459 24054	REAR DRNAMENT	ī	4822 111 30245	47	5	CR16	R220
5322 462 44181	REAR FOOT	4	4822 111 30347	10	5	CR16	R221
5322 462 44179	BOTTON FOOT	4 4	4822 110 63161	100K	5	CR25	R222
4822 462 70497	PLUG BOTTOM FOOT	4	4822 110 63116	2.2K	5	CR25	R223
			4822 110 63125	4.7K	5	CR25	R224
UNIT US ALL MO	DELS		4822 110 63134	10K	5	CR25	R225
Ordering number	r <b>Description</b>	Item	4822 110 63098	470	5	CR25	R226
<u> </u>	Description	100111	4822 110 63116 4822 110 63054	2.2K	5	CR 25	R227
5322 321 24389	CABLE COMPLETE	U3 TO U1	4822 111 30272	-10 680	5 5	CR25	R228
	TEST SOCKET	BU302	4822 110 63098	470	5	CR25 CR25	R229 R230
			7044 110 03070				
5322 268 24073	TEST SOCKET	BU303	4822 110 63116				
5322 268 24073 5322 130 34562	TEST SOCKET LD35/II	BU303 GR301	4822 110 63116 4822 110 63125	2.2K 4.7K	5	CR25	R231 R238
5322 268 24073 5322 130 345 62 5322 130 345 62	TEST SOCKET LD35/II LD35/II	BU303 GR301 GR302	4822 110 63116	2.2K	5	CR25	R231
5322 268 24073 5322 130 34562 5327 130 34562 5322 130 34562	TEST SOCKET LD35/II LD35/II LD35/II	BU303 GR301 GR302 GR303	4822 110 63116 4822 110 63125	2.2K	5	CR25	R231
5322 268 24073 5322 130 345 62 5322 130 345 62 5322 130 345 62 5322 130 345 62	TEST SOCKET LD35/II LD35/II	BU303 GR301 GR302	4822 110 63116 4822 110 63125 UNIT U2 PM6624	2.2K	5	CR25	R231
5322 268 24073 5322 130 34562 5322 130 34562 5322 130 34562 5322 130 34562 5322 130 34562	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II	BU303 GR301 GR302 GR303 GR304 GR305	4822 110 63116 4822 110 63125 UNIT U2 PM6624 FIXED CAPACITORS	2.2K 4.7K	5 5	CR25 CR25	R231 R238
5322 268 24073 5322 130 345 62 5322 130 345 62 5322 130 345 62 5322 130 345 62	TEST SOCKET LD35/II LD35/II LD35/II LD35/II	BU303 GR301 GR302 GR303 GR304	4822 110 63116 4822 110 63125 UNIT U2 PM6624	2.2K 4.7K	5	CR25 CR25	R231 R238
5322 268 24073 5322 130 34562 5322 130 34562 5322 130 34562 5322 130 34562 5322 130 34562	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II	BU303 GR301 GR302 GR303 GR304 GR305 GR306	4822 110 63116 4822 110 63125 UNIT U2 PM6624 FIXED CAPACITORS Ordering number	2.2K 4.7K	5 5 Tol.(%	CR25 CR25 ) Volts	R231 R238
5322 268 24073 5322 130 345 b2 5322 130 345 b2	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II	BU303 GR301 GR302 GR303 GR304 GR305 GR306	4822 110 63116 4822 110 63125 UNIT U2 PM6624 FIXED CAPACITORS Ordering number 4822 122 31177	2.2K 4.7K Farad 470P	5 5 Tol.(°/ <sub>0</sub>	CR25 CR25 ) Volts	R231 R238
5322 268 24073 5322 130 34562 5322 130 34562 5322 130 34562 5322 130 34562 5322 130 34562	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II	BU303 GR301 GR302 GR303 GR304 GR305 GR306	4822 110 63116 4822 110 63125 UNIT U2 PM6624 FIXED CAPACITORS Ordering number 4822 122 31177 4822 122 31177	2.2K 4.7K Farad 470P 470P	Tol.(°/ <sub>0</sub>	CR25 CR25 ) Volts	R231 R238 Ltem C201 C202
5322 268 24073 5322 130 345 b2 5322 130 345 b2	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307	4822 110 63116 4822 110 63125 UNIT U2 PM6624 FIXED CAPACITORS Ordering number 4822 122 31177	2.2K 4.7K Farad 470P	5 5 Tol.(°/ <sub>0</sub>	CR25 CR25 ) Volts	R231 R238 Ltem C201 C202 C203
5322 268 24073 5322 130 345 b2 5322 130 345 b2	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307	4822 110 63116 4822 110 63125 UNIT U2 PM6624 FIXED CAPACITORS Ordering number 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 30043	2.2K 4.7K Farad 470P 470P 470P	Tol.(°/ <sub>0</sub>	) Volts	R231 R238 Ltem C201 C202
5322 268 24073 5322 130 345 b2 5322 130 345 b2	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307	4822 110 63116 4822 110 63125 UNIT U2 PM6624 FIXED CAPACITORS Ordering number 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 30043 5322 122 34043	2.2K 4.7K Farad 470P 470P 470P 10N 47P	Tol.(°/o  10 10 10 10 -20+80 2	CR25 CR25 ) Volts 100 100 100 63 50	R231 R238 Ltem C201 C202 C203 C204 C205 C206
5322 268 24073 5322 130 345 b2 5322 130 345 b2 UNIT U4 ALL MO Ordering numbers 1322 321 24391 5322 321 24391 5322 277 24006	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II D35/II CD35/II CD35/II CD35/II CD35/II CD35/II CD35/II  DELS er Description	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307	4822 110 63116 4822 110 63125 UNIT U2 PM6624 FIXED CAPACITORS Ordering number 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 30043 5322 122 34043 4822 122 31175	2.2K 4.7K Farad 470P 470P 470P 10N 47P 1N	Tol.(°/o  10 10 10 10 -20+80	CR25 CR25 ) Volts 100 100 100 63 50 100	R231 R238 Ltem C201 C202 C203 C204 C205 C206 C207
5322 268 24073 5322 130 345 b2 5322 130 345 b2 UNIT U4 ALL MO Ordering number 5322 321 24391 5322 277 24006 5322 277 24006	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II  LD35/II CD35/II CD35/II CD35/II CD35/II  DELS er Description  CABLE COMPLETE SLIDE SWITCH SLIDE SWITCH	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307	4822 110 63116 4822 110 63125 UNIT U2 PM6624 FIXED CAPACITORS Ordering number 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 30043 5322 122 34043 4822 122 31175 5322 124 14079	2.2K 4.7K Farad 470P 470P 470P 10N 47P 1N 68M	Tol.(°/o  10 10 10 10 -20+80 2 10	CR25 CR25 ) Volts 100 100 10 63 50 100 6.3	R231 R238 Ltem C201 C202 C203 C204 C205 C206 C207 C208
5322 268 24073 5322 130 345 b2 UNIT U4 ALL MO Ordering numb  5322 321 24391 5322 277 24006 5322 277 24006 5322 101 54008	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II  DBLS er Description  CABLE COMPLETE SLIDE SWITCH SLIDE SWITCH COMBINED SK403-SK40	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307 U4 TO U1 SK401 SK402 4R401	4822 110 63116 4822 110 63125 UNIT U2 PM6624 FIXED CAPACITORS Ordering number 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 3043 5322 122 34043 4822 122 31175 5322 124 14079 4822 122 31043	2.2K 4.7K Farad 470P 470P 470P 470P 10N 47P 1N 68M 3.9P	Tol.(°/o  10 10 10 10 -20+80 2 10 2	CR25 CR25 100 100 100 10 63 50 100 6.3	R231 R238 Item C201 C202 C203 C204 C205 C206 C207 C208 C209
5322 268 24073 5322 130 345 b2 5322 130 345 b2 UNIT U4 ALL MO Ordering number 5322 321 24391 5322 277 24006 5322 277 24006	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II  LD35/II CD35/II CD35/II CD35/II CD35/II  DELS er Description  CABLE COMPLETE SLIDE SWITCH SLIDE SWITCH	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307 U4 TO U1 SK401 SK402 4R401	4822 110 63116 4822 110 63125 UNIT U2 PM6624 FIXED CAPACITORS Ordering number 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 30043 5322 122 34043 4822 122 31175 5322 124 14079 4822 122 31043 4822 122 31043 4822 122 31043	2.2K 4.7K Farad 470P 470P 470P 470P 10N 47P 1N 68M 3.9P 220P	Tol.(°/o  10 10 10 10 -20+80 2 10 2 10	CR25 CR25 100 100 100 10 63 50 100 6.3 63 100	R231 R238 Item C201 C202 C203 C204 C205 C206 C207 C208 C209 C211
5322 268 24073 5322 130 345 b2 UNIT U4 ALL MO Ordering numb  5322 321 24391 5322 277 24006 5322 277 24006 5322 101 54008	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II  DBLS er Description  CABLE COMPLETE SLIDE SWITCH SLIDE SWITCH COMBINED SK403-SK40	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307 U4 TO U1 SK401 SK402 4R401	4822 110 63116 4822 110 63125  UNIT U2 PM6624 FIXED CAPACITORS  Ordering number  4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31043 5322 122 34043 4822 122 31175 5322 124 14079 4822 122 31043 4822 122 31173 4822 122 30094 4822 122 30177	2.2K 4.7K Farad 470P 470P 470P 470P 10N 47P 1N 68M 3.9P	Tol.(°/o  10 10 10 10 -20+80 2 10 2	CR25 CR25 100 100 100 10 63 50 100 6.3	R231 R238 Item C201 C202 C203 C204 C205 C206 C207 C208 C209
5322 268 24073 5322 130 345 b2 UNIT U4 ALL MO Ordering numb  5322 321 24391 5322 277 24006 5322 277 24006 5322 101 54008	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II  DBLS er Description  CABLE COMPLETE SLIDE SWITCH SLIDE SWITCH COMBINED SK403-SK40	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307 U4 TO U1 SK401 SK402 4R401	4822 110 63116 4822 110 63125  UNIT U2 PM6624 FIXED CAPACITORS  Ordering number  4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31175 5322 124 14079 4822 122 31175 5322 124 14079 4822 122 31173 4822 122 31173 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 30094	2.2K 4.7K Farad 470P 470P 470P 10N 47P 1N 68M 3.9P 220P 220P	Tol.(°/o  10 10 10 10 -20+80 2 10 2 10 10	CR25 CR25 100 100 100 100 63 50 100 6.3 6.3 100 100	R231 R238 Item C201 C202 C203 C204 C205 C206 C207 C208 C209 C211 C212
5322 268 24073 5322 130 345 b2 UNIT U4 ALL MO Ordering numb  5322 321 24391 5322 277 24006 5322 277 24006 5322 101 54008	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II  DBLS er Description  CABLE COMPLETE SLIDE SWITCH SLIDE SWITCH COMBINED SK403-SK40	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307 U4 TO U1 SK401 SK402 4R401	4822 110 63116 4822 110 63125  UNIT U2 PM6624 FIXED CAPACITORS  Ordering number  4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31175 5322 124 14079 4822 122 31175 5322 124 14079 4822 122 31173 4822 122 31173 4822 122 31177 4822 122 30043 5322 124 14036	2.2K 4.7K Farad 470P 470P 470P 10N 47P 1N 68M 3.9P 220P 220P 470P 10N 15M	Tol.(°/o  10 10 10 10 -20+80 2 10 2 10 -20+80	CR25 CR25 100 100 100 100 63 50 100 6.3 63 100 100 63	R231 R238 R238 C201 C202 C203 C204 C205 C206 C207 C208 C209 C211 C213 C214 C215
5322 268 24073 5322 130 345 b2 UNIT U4 ALL MO Ordering numb  5322 321 24391 5322 277 24006 5322 277 24006 5322 101 54008	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II  DBLS er Description  CABLE COMPLETE SLIDE SWITCH SLIDE SWITCH COMBINED SK403-SK40	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307 U4 TO U1 SK401 SK402 4R401	4822 110 63116 4822 110 63125  UNIT U2 PM6624 FIXED CAPACITORS  Ordering number  4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31175 5322 124 14079 4822 122 31173 4822 122 31173 4822 122 31173 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 30094 4821 122 31177 4822 122 30043 5322 124 14036 4822 122 31175	2.2K 4.7K Farad 470P 470P 470P 10N 47P 1N 68M 3.9P 220P 470P 10N 15M 1N	Tol.(°/o  10 10 10 10 -20+80 2 10 2 10 -20+80 10	CR25 CR25 100 100 100 63 50 100 6.3 63 100 100 63 100	R231 R238 R238 Ltem C201 C202 C203 C204 C205 C206 C207 C208 C209 C211 C212 C213 C214 C215 C216
5322 268 24073 5322 130 345 b2 UNIT U4 ALL MO Ordering numb  5322 321 24391 5322 277 24006 5322 277 24006 5322 101 54008	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II  DBLS er Description  CABLE COMPLETE SLIDE SWITCH SLIDE SWITCH COMBINED SK403-SK40	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307 U4 TO U1 SK401 SK402 4R401	4822 110 63116 4822 110 63125  UNIT U2 PM6624 FIXED CAPACITORS  Ordering number  4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31175 5322 124 14079 4822 122 31173 4822 122 31173 4822 122 31177 4822 122 31177 4822 122 30094 4822 122 31177 4822 122 31177 4822 122 31175 5322 124 14036 4822 122 31175 5322 122 34043	2.2K 4.7K Farad 470P 470P 470P 170N 470P 170N 170N 220P 220P 470P 10N 15M 15M 147P	Tol.(°/o  10 10 10 10 -20+80 2 10 2 10 10 -20+80 10 2	Volts 100 100 100 100 63 50 100 6.3 63 100 100 6.3 63 100 100 6.3	R231 R238 Item C201 C202 C203 C204 C205 C206 C207 C208 C209 C211 C212 C213 C214 C215 C216 C217
5322 268 24073 5322 130 345 b2 UNIT U4 ALL MO Ordering numb  5322 321 24391 5322 277 24006 5322 277 24006 5322 101 54008	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II  DBLS er Description  CABLE COMPLETE SLIDE SWITCH SLIDE SWITCH COMBINED SK403-SK40	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307 U4 TO U1 SK401 SK402 4R401	4822 110 63116 4822 110 63125  UNIT U2 PM6624 FIXED CAPACITORS  Ordering number  4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31175 5322 124 14079 4822 122 31175 5322 124 14079 4822 122 31177 4822 122 30094 4822 122 31177 4822 122 30094 4822 122 31177 4822 122 30094 4822 122 31177 4822 122 30094 4822 122 31177 4822 122 30094 4822 122 31177 4822 122 30043 5322 124 14036 4822 122 34043 4822 122 34043	2.2K 4.7K Farad 470P 470P 470P 170P 170P 170P 170P 1220P 220P 220P 470P 15M 15M 15M 147P 47P	Tol.(°/o  10 10 10 10 -20+80 2 10 10 -20+80 10 2 10 10 10 10 10 10 10	Volts 100 100 100 100 63 50 100 63 100 100 63 100 100 100 100 100	R231 R238 R238 C201 C202 C203 C204 C205 C206 C207 C208 C207 C212 C212 C213 C214 C215 C217 C218
5322 268 24073 5322 130 345 b2 UNIT U4 ALL MO Ordering numb  5322 321 24391 5322 277 24006 5322 277 24006 5322 101 54008	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II  DBLS er Description  CABLE COMPLETE SLIDE SWITCH SLIDE SWITCH COMBINED SK403-SK40	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307 U4 TO U1 SK401 SK402 4R401	4822 110 63116 4822 110 63125  UNIT U2 PM6624 FIXED CAPACITORS  Ordering number  4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31043 4822 122 31043 4822 122 31043 4822 122 31043 4822 122 31177 4822 122 31043 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31175 5322 124 14036 4822 122 31175 5322 124 14036 4822 122 31175 5322 124 34043 4822 122 31072 4822 122 31072	2.2K 4.7K Farad 470P 470P 470P 470P 10N 47P 10N 15M 15M 17P 47P 10N	Tol.(°/o  10 10 10 10 -20+80 2 10 10 -20+80 10 -20+80	CR25 CR25 100 100 100 63 50 100 63 100 100 63 100 100 63 100 63	R231 R238 R238 C201 C202 C203 C204 C205 C206 C207 C208 C207 C208 C211 C212 C213 C214 C215 C217 C218 C217
5322 268 24073 5322 130 345 b2 UNIT U4 ALL MO Ordering numb  5322 321 24391 5322 277 24006 5322 277 24006 5322 101 54008	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II  DBLS er Description  CABLE COMPLETE SLIDE SWITCH SLIDE SWITCH COMBINED SK403-SK40	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307	4822 110 63116 4822 110 63125  UNIT U2 PM6624 FIXED CAPACITORS  Ordering number  4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31043 5322 124 14079 4822 122 31043 4822 122 31173 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31175 5322 124 14036 4822 122 31175 5322 122 34043 4822 122 31072 4822 122 31072 4822 122 31072 4822 122 31175 5322 122 34043	2.2K 4.7K Farad 470P 470P 470P 170P 170P 170P 170P 1220P 220P 220P 470P 15M 15M 15M 147P 47P	Tol.(°/o  10 10 10 10 -20+80 2 10 10 -20+80 10 2 10 10 10 10 10 10 10	Volts 100 100 100 100 63 50 100 63 100 100 63 100 100 100 100 100	R231 R238 R238 C201 C202 C203 C204 C205 C206 C207 C208 C211 C212 C213 C214 C215 C217 C218 C219 C220
5322 268 24073 5322 130 345 b2 UNIT U4 ALL MO Ordering numb  5322 321 24391 5322 277 24006 5322 277 24006 5322 101 54008	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II  DBLS er Description  CABLE COMPLETE SLIDE SWITCH SLIDE SWITCH COMBINED SK403-SK40	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307	4822 110 63116 4822 110 63125  UNIT U2 PM6624 FIXED CAPACITORS  Ordering number  4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31175 5322 124 14079 4822 122 31173 4822 122 31043 4822 122 31173 4822 122 31043 4822 122 31177 4822 122 30094 4822 122 31177 4822 122 30043 5322 124 14036 4822 122 31072 4822 122 31072 4822 122 31072 4822 122 31072 4822 122 31072 4822 122 31072 4822 122 31075 5322 122 34043 4822 122 31075	2.2K 4.7K Farad 470P 470P 470P 10N 47P 10N 68M 3.9P 220P 470P 10N 15M 10N 47P 10N 15M 10N 47P 10N 10N 10N 10N 10N 10N 10N 10N 10N 10N	Tol.(°/o  10 10 10 10 -20+80 2 10 2 10 -20+80 10 -20+80 10 -20+80	CR25 CR25 100 100 100 63 50 100 63 100 100 63 16 100 100 63 100	R231 R238 R238 C201 C202 C203 C204 C205 C206 C207 C208 C207 C208 C211 C213 C214 C215 C216 C217 C218 C2219 C221
5322 268 24073 5322 130 345 b2 UNIT U4 ALL MO Ordering numb  5322 321 24391 5322 277 24006 5322 277 24006 5322 101 54008	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II  DBLS er Description  CABLE COMPLETE SLIDE SWITCH SLIDE SWITCH COMBINED SK403-SK40	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307	4822 110 63116 4822 110 63125  UNIT U2 PM6624 FIXED CAPACITORS  Ordering number  4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31175 5322 124 14079 4822 122 31173 4822 122 31043 4822 122 31173 4822 122 31043 4822 122 31177 4822 122 30094 4822 122 31177 4822 122 30043 5322 124 14036 4822 122 31175 5322 124 14036 4822 122 31072 4822 122 31072 4822 122 31072 4822 122 31072 4822 122 31075 5322 122 34043 4822 122 31175 5322 122 34043 4822 122 31175	2.2K 4.7K Farad 470P 470P 470P 10N 47P 10N 88M 3.9P 220P 470P 10N 15M 10N 47P 10N 17P 47P 10N 47P 10N 47P 10N 47P 10N 47P 10N 47P 10N 47P 10N 47P 10N 47P 10N 47P 10N 47P 10N 47P 10N 47P 10N 47P 10N 47P 10N 10N 10N 10N 10N 10N 10N 10N 10N 10N	Tol.(°/o  10 10 10 10 -20+80 2 10 2 10 -20+80 10 2 10 -20+80 10 2	CR25 CR25 100 100 100 100 63 50 100 63 16 100 100 63 16 100 100 50	R231 R238 R238 C201 C202 C203 C204 C205 C206 C207 C207 C211 C212 C213 C214 C215 C217 C216 C217 C218 C220 C221
5322 268 24073 5322 130 345 b2 UNIT U4 ALL MO Ordering numb  5322 321 24391 5322 277 24006 5322 277 24006 5322 101 54008	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II  DBLS er Description  CABLE COMPLETE SLIDE SWITCH SLIDE SWITCH COMBINED SK403-SK40	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307	4822 110 63116 4822 110 63125  UNIT U2 PM6624 FIXED CAPACITORS  Ordering number  4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31175 5322 124 14079 4822 122 31173 4822 122 31043 4822 122 31173 4822 122 31043 4822 122 31177 4822 122 30043 5322 124 14036 4822 122 31175 5322 124 14036 4822 122 31175 5322 122 34043 4822 122 31072 4822 122 31072 4822 122 31072 4822 122 31072 4822 122 31175 5322 122 34043 4822 122 31175 5322 122 34043 4822 122 31175 5322 122 34043 4822 122 31175 5322 122 34043	2.2K 4.7K Farad 470P 470P 470P 10N 47P 10N 8.99P 220P 470P 10N 15M 147P 10N 17P 10N 17P 10N 17P 10N 17P 10N 17P 10N 17P 10N 17P 17P 17P 17P 17P 17P 17P 17P 17P 17P	Tol.(°/o  10 10 10 10 -20+80 2 10 2 10 -20+80 10 2 10 -20+80 10 2 10 -20+80	CR25 CR25 100 100 100 63 50 100 63 100 100 63 100 100 100 100 100 100 100	R231 R238 R238 C201 C202 C203 C204 C205 C206 C207 C208 C211 C212 C213 C214 C216 C217 C218 C219 C220 C221 C222 C222 C222
5322 268 24073 5322 130 345 b2 UNIT U4 ALL MO Ordering numb  5322 321 24391 5322 277 24006 5322 277 24006 5322 101 54008	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II  DBLS er Description  CABLE COMPLETE SLIDE SWITCH SLIDE SWITCH COMBINED SK403-SK40	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307	4822 110 63116 4822 110 63125  UNIT U2 PM6624 FIXED CAPACITORS  Ordering number  4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31175 5322 124 14079 4822 122 31173 4822 122 31173 4822 122 31177 4822 122 31177 4822 122 31175 5322 124 14036 4822 122 31175 5322 124 14036 4822 122 31175 5322 122 34043 4822 122 31175 5322 122 34043 4822 122 31175 5322 122 34043 4822 122 31175 5322 122 34043 4822 122 31175 5322 122 34043 4822 122 31175 5322 122 34043 4822 122 31175 5322 122 34043 4822 122 31175 5322 122 34043 4822 122 31175 5322 122 34043	2.2K 4.7K Farad 470P 470P 470P 470P 10N 47P 10N 47P 10N 15M 147P 10N 147P 10N 15M 147P 10N 147P 10N 147P 10N 168M 168M 168M 168M 168M 168M 168M 168M	Tol.(°/o  10 10 10 10 10 -20+80 2 10 10 -20+80 10 2 10 -20+80 10 -20+80	CR25 CR25 100 100 100 100 63 50 100 100 63 16 100 100 63 16 100 100 63 16 100 100 63 16 100 100 63 100 100 63 100 100 63 100 100 63 100 100 63 100 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 63 63 63 63 63 63 63 63 63 63 63 63	R231 R238 R238 C201 C202 C203 C204 C205 C206 C207 C208 C207 C208 C211 C213 C214 C215 C216 C217 C218 C2219 C221
5322 268 24073 5322 130 345 b2 UNIT U4 ALL MO Ordering numb  5322 321 24391 5322 277 24006 5322 277 24006 5322 101 54008	TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II  DBLS er Description  CABLE COMPLETE SLIDE SWITCH SLIDE SWITCH COMBINED SK403-SK40	BU303 GR301 GR302 GR303 GR304 GR305 GR306 GR307	4822 110 63116 4822 110 63125  UNIT U2 PM6624 FIXED CAPACITORS  Ordering number  4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31177 4822 122 31175 5322 124 14079 4822 122 31173 4822 122 31043 4822 122 31173 4822 122 31043 4822 122 31177 4822 122 30043 5322 124 14036 4822 122 31175 5322 124 14036 4822 122 31175 5322 122 34043 4822 122 31072 4822 122 31072 4822 122 31072 4822 122 31072 4822 122 31175 5322 122 34043 4822 122 31175 5322 122 34043 4822 122 31175 5322 122 34043 4822 122 31175 5322 122 34043	2.2K 4.7K Farad 470P 470P 470P 470P 10N 47P 10N 10N 10N 10N 10N 10N 10N 10N 10N 10N	Tol.(°/o  10 10 10 10 -20+80 2 10 2 10 10 -20+80 10 2 10 -20+80 10 2 10 10 10	CR25 CR25 100 100 100 100 63 50 100 100 63 16 100 100 63 16 100 100 63 16 100 100 63 16 100 100 63 100 100 63 100 100 63 100 100 63 100 100 63 100 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 100 63 63 63 63 63 63 63 63 63 63 63 63 63	R231 R238 R238 C201 C202 C203 C204 C205 C206 C207 C206 C207 C208 C211 C212 C213 C214 C215 C217 C221 C221 C222 C222 C222 C222 C222

UNIT UZ PM6624		UNIT U2 PM6625				
INTEGRATED CIRCUITS Ordering number Type	Item	FIXED RESISTORS Ordering number	Ohm	Tol (9/2)	Time	lkam
oraci ing transer type	10011	or dering trainber	011111	101(-78)	Type	15511)
5322 209 85414 OM334	IC201	5322 116 54393	150	5	PR52	R201
5322 209 85414	10202 10203	5322 116 54396 5322 116 54396	68 68	5	PR52	R202
5322 209 84163 SN72741P	10204	5322 116 50417	68 162	5 5	PR52 MR25	R203 R204
5322 209 84163	1C205 1C206	4822 111 30328	330	5	CR16	R205
5322 209 84165 SN7474N	10207	4822 110 63125 4822 110 63147	4.7K 33K	5 5	CR25 CR25	R206 R207
		4822 110 63107	1K	5	CR25	R208
UNIT U2 PM6624		4822 110 63125 4822 110 63152	4.7K 47K	5 5	CR25	R209 R210
TRANSISTORS		4822 110 63107	1K	5	CR25	R211
Ordering number Type	<u>  tem</u>	4822 110 63138 4822 111 30348	15K 27	5 K	CR25 CR16	R212 R213
4822 130 40937 BC548B	T\$201	4822 110 63134	ĵοκ	5 5	CR25	R214
5322 130 40348 BC178B	T\$202	4822 110 63141	18K	5 5	CR25	R215
5322 130 44179 BFR90 4822 130 40937 BC548B	T\$203 T\$204	4822 110 63094 4822 111 30265	330 2.2K	5	CR25 CR16	R216 R217
5322 130 40343 BC108B	T\$205	4822 111 30331	470	5 5	CR16	R218
		4822 111 30312 4822 111 30327	4.7K 220	5 5	CR16 CR16	R219 R220
UNIT U2 PM6224		4822 111 30347	10	5	CR16	R221
DIODES		4822 110 63161 4822 110 63116	100K 2•2K	5 5	CR25	R222 R223
Ordering number Type	<u>Item</u>	4822 110 63116	2.2K	5		R224
5322 130 34364 BA379	GR201	4822 110 63134 4822 110 63098	10K	5		R225
5322 130 34364 BA379	GR202	4822 110 63116	470 2.2K	5 5	CR25	R226 R227
5322 130 34283 HP5082=2835 5322 130 34283 HP5082=2835	GR203 GR204	4822 110 63054	10	5	CR25	R228
5322 130 34364 BA379	GR205	4822 111 30272 4822 110 63098	680 470	5 5	CR16 CR25	R229 R230
5322 130 34364 BA379 5322 130 34364 BA379	GR206 GR207	4822 110 63116	2.2K	5	CR25	R231
5322 130 30613 BAW62	GR208	4822 111 30324 4822 111 30328	100 330	5 5		R233 R234
5322 130 34283 HP5082-2835	GR209	4822 111 30328	330	5		R235
5322 130 34283 HP5082-2835	GR210	4822 110 63098	470	5	CRIA	R236
		4827 110 63040		<b>-</b>		
5322 130 30666 BZX79=C7V5	GR211	4822 110 63069 4822 110 63125	39 4.7K	5	CR16	R237
5322 130 30666 BZX79-C7V5		4822 110 63069	39	5		R237
		4822 110 63069 4822 110 63125 UNIT U2 PM6625	39	5	CR16	R237
5322 130 30666 BZX79=C7V5 UNIT U2 PM6624		4822 110 63069 4822 110 63125 UNIT U2 PM6625 FIXED CAPACITORS	39 4.7K	5 5	CR16 CR16	R237 R238
UNIT U2 PM6624 INDUCTANCES Ordering number Description  5322 158 14119 COIL	GR211 Item	4822 110 63069 4822 110 63125 UNIT U2 PM6625	39 4.7K	5 5	CR16 CR16	R237 R238
UNIT U2 PM6624 INDUCTANCES  Ordering number Description  5322 158 14119 COIL 5322 158 14119 COIL	GR211 <u>Item</u> L201 L202	4822 110 63069 4822 110 63125 UNIT U2 PM6625 FIXED CAPACITORS Ordering number 5322 122 34071	39 4.7K Farac	5 5 d Tol.(% 20	CR16 CR16 ) Volts	R237 R238
UNIT U2 PM6624 INDUCTANCES  Drdering number Description  5322 158 14119 COIL 5322 158 14119 COIL 5322 158 10276 INDUCTANCE 4.7MH	GR211   Item   L201   L202   L203	4822 110 63069 4822 110 63125 UNIT U2 PM6625 FIXED CAPACITORS Ordering number 5322 122 34071 5322 122 34071	39 4.7K Farac 470P 470P	5 5 1 Tol (%) 20 20	CR16 CR16 ) Volts 50	R237 R238 GItem C201 C202
UNIT U2 PM6624 INDUCTANCES  Ordering number Description  5322 158 14119 COIL 4822 526 10025 FXC BEAD	Item L201 L202 L203 L204 L205	4822 110 63069 4822 110 63125 UNIT U2 PM6625 FIXED CAPACITORS Ordering number 5322 122 34071 5322 122 34071 5322 122 34071 5322 122 34071	39 4.7K Farac	5 5 d Tol.(% 20	CR16 CR16 ) Volts	R237 R238
UNIT U2 PM6624 INDUCTANCES  Drdering number Description  5322 158 14119 COIL 5322 158 14119 COIL 5322 158 10276 INDUCTANCE 4.7MH 5322 158 14119 COIL 4822 526 10025 FXC BEAD 4822 526 10025 FXC BEAD	SR211   SR21	4822 110 63069 4822 110 63125 UNIT U2 PM6625 FIXED CAPACITORS Ordering number 5322 122 34071 5322 122 34071 5322 122 34071 5322 122 34071 4822 122 30043	39 4.7K Farac 470P 470P 470P 10N	5 5 20 20 20 20 20 20 20 20	CR16 CR16 ) Volts 50 50 50 50 63	R237 R238 GItem C201 C202 C203 C204 C205
UNIT U2 PM6624 INDUCTANCES  Drdering number Description  5322 158 14119 COIL 5322 158 14119 COIL 5322 158 14119 COIL 5322 158 14119 COIL 4822 526 10025 FXC BEAD	Item L201 L202 L203 L204 L205	4822 110 63069 4822 110 63125 UNIT U2 PM6625 FIXED CAPACITORS Ordering number 5322 122 34071 5322 122 34071 5322 122 34071 5322 122 34071 4822 122 34071 4822 122 34043	39 4.7K Farac 470P 470P 470P	5 5 20 20 20 20 20	CR16 CR16 ) Volts 50 50 50 63 50	R237 R238 GItem C201 C202 C203 C204 C205 C206
UNIT U2 PM6624 INDUCTANCES  Drdering number Description  5322 158 14119 COIL 5322 158 14119 COIL 5322 158 14119 COIL 5322 158 14119 COIL 4822 526 10025 FXC BEAD	Item L201 L202 L203 L204 L205 L207 L208 L209 L210	4822 110 63069 4822 110 63125 UNIT U2 PM6625 FIXED CAPACITORS Ordering number 5322 122 34071 5322 122 34071 5322 122 34071 5322 122 34071 4822 122 30043 5322 122 34043 4822 122 31175 5322 124 14079	39 4.7K Farac 470P 470P 470P 10N 47P 1N 68M	5 5 5 20 20 20 20 20 -20+80 10 10 -10+50	CR16 CR16 ) Volts 50 50 50 63 50 100 6.3	R237 R238 I tem C 201 C 202 C 203 C 204 C 205 C 206 C 207 C 208
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TRANS	SIST		_	
urae	ring	numb	er Type	Item
4822 5322 5322 4822 5322 5322	130 130 130	44179 40937 40343	BC548B BC178B BFR90 BC548B BC108B 2N5770	TS201 TS202 TS203 TS204 TS205 TS206
DIODE	5	M6625		
<u>Orde</u>	ring	ոստե	er Type	Item
5322 5322 5322 5322 5322 5322 5322 5322	130 130 130 130 130 130	34364 34364 34283 342864 34364 34364 30613 34283 34283 30666 34364 30666 30411 30411	BA379 BA379 HP5082-2835 HP5082-2835 BA379 BA379 BA379 BAW62 HP5082-2835 HP5082-2835 BZX79-C7V5 BA379 BZX79-C7V5 BZX79-C3V9 BZX79-C3V9	GR201 GR202 GR203 GR204 GR205 GR206 GR207 GR208 GR209 GR210 GR211 GR212 GR213 GR214 GR215
INDUC	TANS		er Description	l+em
	· · · · · · · · · · · · · · · · · · ·	Hamb		Item
5322 5322 5322 5322 5322 5322 5322 5322	158 158 158 158 158 158 157 526 526 526	14119 14119 10276 14119 14119 14119 14119 14119 14024 10025 10025 10025	COIL COIL INDUCTANCE 4.7 COIL COIL COIL COIL COIL FXC BEAD FXC BEAD FXC BEAD FXC BEAD FXC BEAD	L201 L202 TMH L203 L204 L205 L206 L207 L208 L209 L210 L211 L212 L214
MECHA	NICA	M6625 L PART	s er Description	Item Oty.
5322 5322 5322 5322 5322 5322	265 265 535 255	54006 54018 94711 44122 40089	FEMALE CONNECTOR MALE CONNECTOR DISTANCE PIECE 1C HOLDER 14 PIN TRANSISTOR HOLDE GUIDE RAIL	BU201 1 BU201 1 FOR U2 2 S DIL 1

#### 5. Circuit description prescaler units and power supply

#### 5.1. Prescaler PM 6624

Unit U2 contains the 520 MHz amplifier and prescaler circuits, and also two D flip-flops IC 206 and IC 207 dividing the time base signal generated on unit U1. The signal to be measured enters the input amplifier at socket BU 2. After AC coupling capacitor C 201, a resistive atteuator network R 201 . . . R 204 is incorporated which maintains he VSWR of the input and also serves as a series impedance for the PIN diode attentuator GR 201 and GR 202. Schottky diodes GR 203 and GR 204 are clipping the signal but generate also current to the PIN diodes which provide automatically the proper attenuation of high-amplitude signals.

At low amplitude the signal passes this first PIN diode attenuator unchanged to the next PIN diode attenuator GR 205...GR 207. Here the amplitude is reduced further before the signal is entering the input amplifier.

After input conditioning, the measuring signal is applied to two cascade wide-band amplifiers IC 201 and IC 202. The signal level at IC 202 is detected by GR 209, GR 210 controlling the AGC amplifier IC 204 and Schmitt trigger IC 205.

When the detected level is sufficient, IC 204 starts controlling the PIN diode attenuator GR 205...GR 207. Transistor TS 201 ensures a linear attenuator response within the input signal range.

Via R 213, C 213 and amplifier TS 203 the signal is fed to input 10 of divide-by-eight circuit IC 203. Output 1 provides the divided signal to the 80 MHz input omplifier, BU 201 The detected signal from GR 209, 210 is also fed to operationel amplifier IC 205 performing a Schmitt trigger function. When no measuring signal is present or at a low detected level, output IC 205:6 is positive. TS 204 is then turned on, shorts the output line to earth.

When the detected signal from GR 209, 210 has reached a sufficient level, IC 205:6 goes LOW and TS 204 is turned off.

TS 202 is controlled by switch SK 401. When the switch is set to position INPUT A the level at BU 201:5 PRESCALER, goes HIGH which turns TS 202 off. Via R 230 and GR 211, also TS 205 is switched off. No supply voltage for the amplifier is present until switch SK 401 is set to position INPUT C and BU 201:5 goes LOW.

The two D flip-flops of IC 206 and one D flip-flop of IC 207 provide the division by 8 of the time base frequency TB 1.

#### 5.2. Prescaler PM 6625

The input conditioning section of the 1 GHz amplifier up to IC 201 and the AGC and Schmitt trigger circuits are principally the same as in the 520 MHz amplifier of PM 6624. Refer to that description.

After input conditioning, the measuring signal is applied to two cascade wide-band amplifiers IC 201 and IC 202. The signal level at IC 202:7 is detected by GR 209, GR 210 controlling the AGC amplifier IC 204 and Schmitt trigger IC 205.

Via R 213, C 213 and amplifier TS 203, the signal is fed to input 4 of divide-by-four circuit IC 203. The complementary outputs 10 and 11 of this circuit provide the signal to the next 4-divider IC 208 via zeners GR 214, GR 215. These diodes are interfacing the +1 V output of IC 203 with the —3 V input requirement of IC 208. The measuring signal frequency now divided by 16, is fed via TS 206 to the output line BU 201:1 which is connected with BU 102:1 to the 80 MHz input amplifier.

TS 202 is controlled by switch SK 401. When the switch is set to position INPUT A the level at BU 201:5, PRESCALER, goes HIGH which turns TS 202 off. Via R 230 and GR 211 also TS 205 is switched off. No supply voltage for the amplifier is present until SK 401 is set to position INPUT C and BU 201:5 goes LOW.

The four D flip-flops of IC 206 and IC 207 provide the division by 16 of the time base frequency TB 1.

#### 5.3. Power supply

The power supply operates from 115 V AC or 230 V AC 50 to 400 Hz or from the internal battery PM 9673 or from an external battery with an output voltage of 12 to 28 V. It provides five stabilised and overload-protected voltages of +120 V, +12 V, +5 V, -5 V and -50 V.

The power supply may be divided into the power input circuit mainly consisting of the mains transformer T 101 and rectifier GR 167, the over-voltage protection circuit mainly consisting of thyristors TS 150, TS 151 and zener diode GR 160, the voltage regulation circuit mainly consisting of voltage regulator IC 150, thyristor TS 154, the DC-to-DC converter mainly consisting of primary side of transformer T 102, driver TS 152 and switch TS 153.

#### Power input circuit

When the power supply operates from the mains, the 115 V AC or 230 V AC is transformed to 20 V AC by transformer T 101, rectified in the diode-bridge GR 167, filtered by C 152 and C 161 and fed to the power supply circuits via switch SK 121 and SK 102.

When the power supply operates from an exernal battery the current to the power supply circuits a fed from BU 21 at the rear panel via protecting aliode GR 164 and switches SK 121 and SK 102.

When the internal battery is used the current > fed from pin 8 of BU 105 via SK 121 and SK 102 to the power supply circuits.

#### Over-voltage protection

The over-voltage protection circuit consists mainly of thyristors TS 150, TS 151 and zener diode GR 160.

The anode of GR 160 is connected to the  $+5\,\mathrm{V}$  output from the power supply. If this voltage increases to  $5.6\,\mathrm{V}\dots5.8\,\mathrm{V}$ , the zener diode GR 160 will start to conduct and a current will flow through resistor R 1121. The voltage drop across R 1121 is fed to the gate of thyristor TS 151 via resistor R 1120. The anode is connected to the  $+5\,\mathrm{V}$  output voltage via resistor R 1118.

The thyristor will switch on and a voltage drop arises across resistor R 1122. This voltage is fed to the gate of thyristor TS 150, whose anode is connected to the d.c. input voltage. The thyristor will switch on and blow fuse VL 150, or, if the counter is operating in the internal battery mode, fuse VL 1 in the battery unit PM 9673. The capacitor across the gate and cathode of thyristor TS 151 prevents transients from the mains to blow fuse VL 150 accidentally.

#### DC to DC converter

The DC to DC converter is basically a blocking oscillator consisting mainly of switch transistor TS 153 and terminals 4—9 of the transformer T 102. When switch SK 102 is set to position ON, the DC voltage from the power input circuit is fed to the transistor TS 155 which works as a constant current source of approximately 1 mA  $(l_1)$ .

The current  $l_1$  will cause switch transistor TS 153 to start conducting and the linearly increasing current  $l_2$  to flow.

This current  $l_2$  will cause a voltage across terminals 3—8 of the transformer and the current  $l_3$  will start to flow.

This will cause drive transistor TS 152 to saturate switch transistor TS 153. When the transistor no longer can saturate, current  $I_3$  will stop to increase and the induced voltage at terminal 3 of transformer T 102 will disappear.

This will cause TS 153 to switch off and the collector voltage to rise to the same level as the supply voltage. At this moment the magnetic flux will discharge through the secondary windings of T 102 and diodes GR 155—159.

#### Output voltage regulation circuit

The output voltage regulation circuit consists mainly of voltage regulator IC 150 and thyristor TS 154.

The purpose of the thyristor TS 154 is to switch off the drive transistor TS 152 in order to regulate the output voltage. The switching moment of thyristor TS 154 is determined by a voltage at the gate of the thyristor which is the sum of a DC regulation voltage from terminal 10 of IC 150 and a sawtooth voltage caused by the emitter current of TS 153 through resistor R 1114//R 1115.

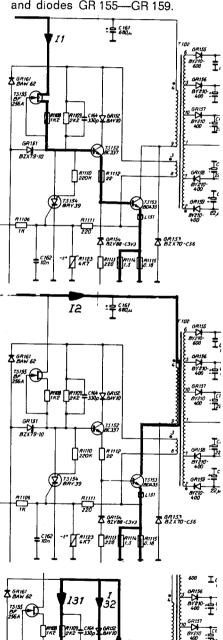
The voltage regulator IC 150 is fed at terminal 12 with the supply voltage and at terminal 7 with a negative voltage, via GR 161, from winding 3—8 of transformer T 102.

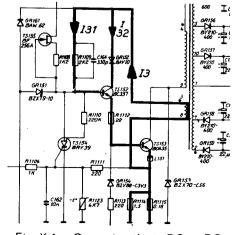
IC 150 contains a differential amplifier with inputs at terminals 4 and 5.

The input at terminal 5 is grounded via R 1104 and the

input at terminal 4 is connected to a voltage divider that consists of the reference output at terminal 6 and the negative voltage from winding 3—8 of transformer T 102 at terminal 7.

The differential amplifier is in balance when the voltage at terminal 7 is —5 V. When the supply voltage across windings 4—9 of transformer T 102 increases, the voltage at the differential amplifier at terminal 7 of IC 150 will go more negative, the DC regulation voltage at terminal 10 of IC 150 will go positive and turn on thyristor TS 154. This will connect the base of driver transistor to the ground and cause switch transistor TS 153 to switch off. The stored magnetic flux will then discharge in the secondary windings of T 102 and diodes GR 155—GR 159.





#### 6. Test conditions

#### 6.1. DC voltages.

The d.c. voltages in the circuit diagrams are typical and may vary slightly between instruments.

Unless otherwise stated the voltages are positive related to earth and measured without input signal. The test instrument can be analogue or digital with an input impedance of at least 40  $k\Omega/V.$ 

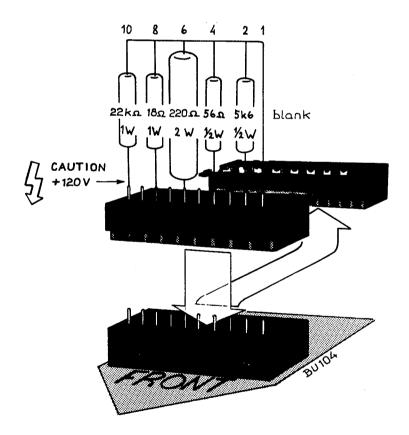
**NOTE.** When measuring d.c. voltages in the input amplifier of the prescaler use sampling oscilloscope PM 3400 and FET probe PM 9353.

6.2. Troubleshooting the power supply section A fault in the power supply can be isolated easier if the counter circuits are disconnected by removing

10-pins connector BU 107. However, to simulate the load, a dummy load has to be fitted as shown in the figure. The dummy load can be assembled of the following components:

1 female connector 10 pins	5322 267 54102
1 carbon resistor 22 $\Omega$ , 1 W	4822 110 23143
1 carbon resistor 220 $\Omega$ , 1 W	4822 110 23089
1 carbon resistor, $18\Omega$ , $2W$	4822 110 10061
1 carbon resistor, $56\Omega$ , $0.5W$	4822 110 53074
1 carbon resistor, 5.6 k $\Omega$ , 0.5 W	4822 110 53127

CAUTION: + 120 V at pin 10 of the connector!



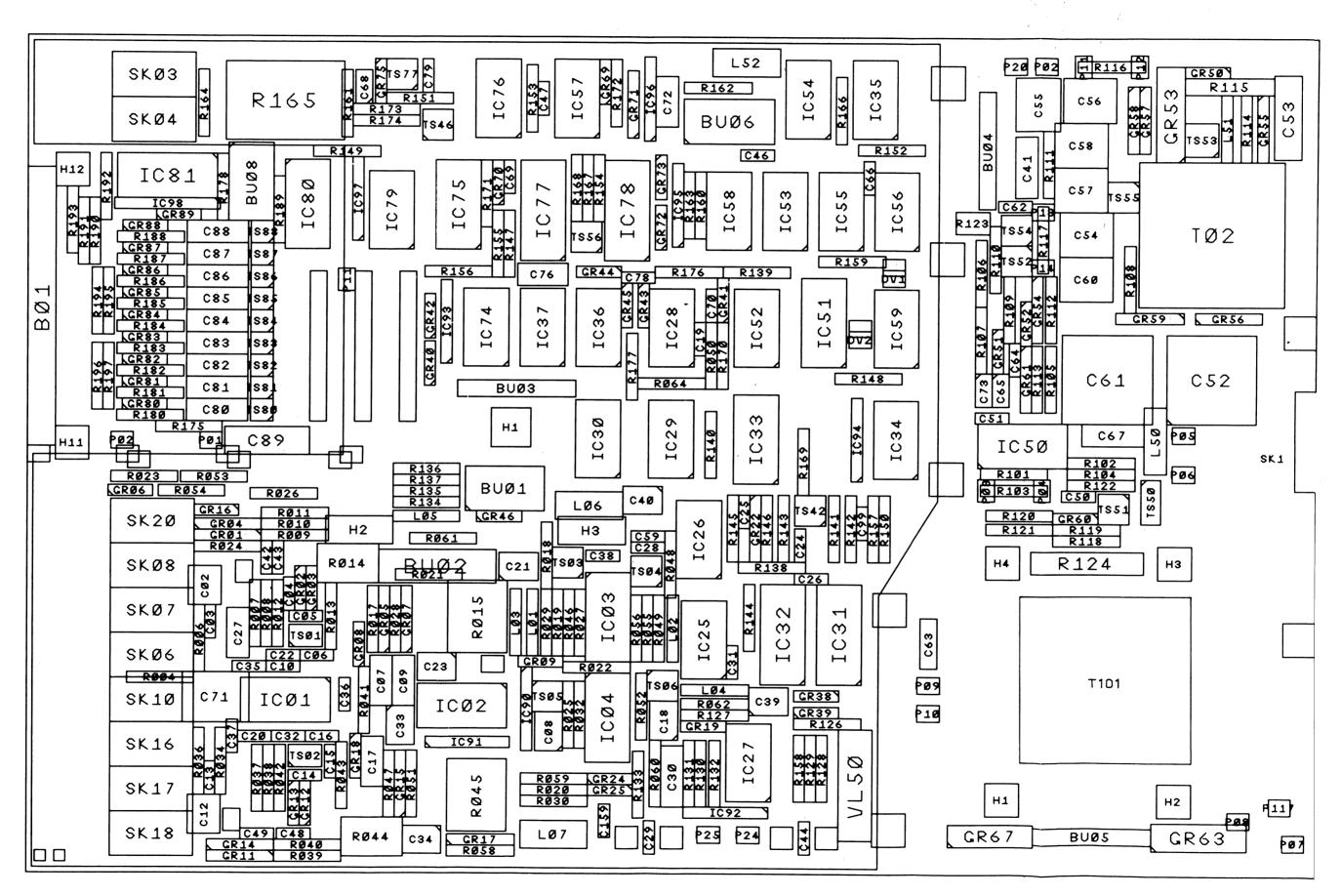
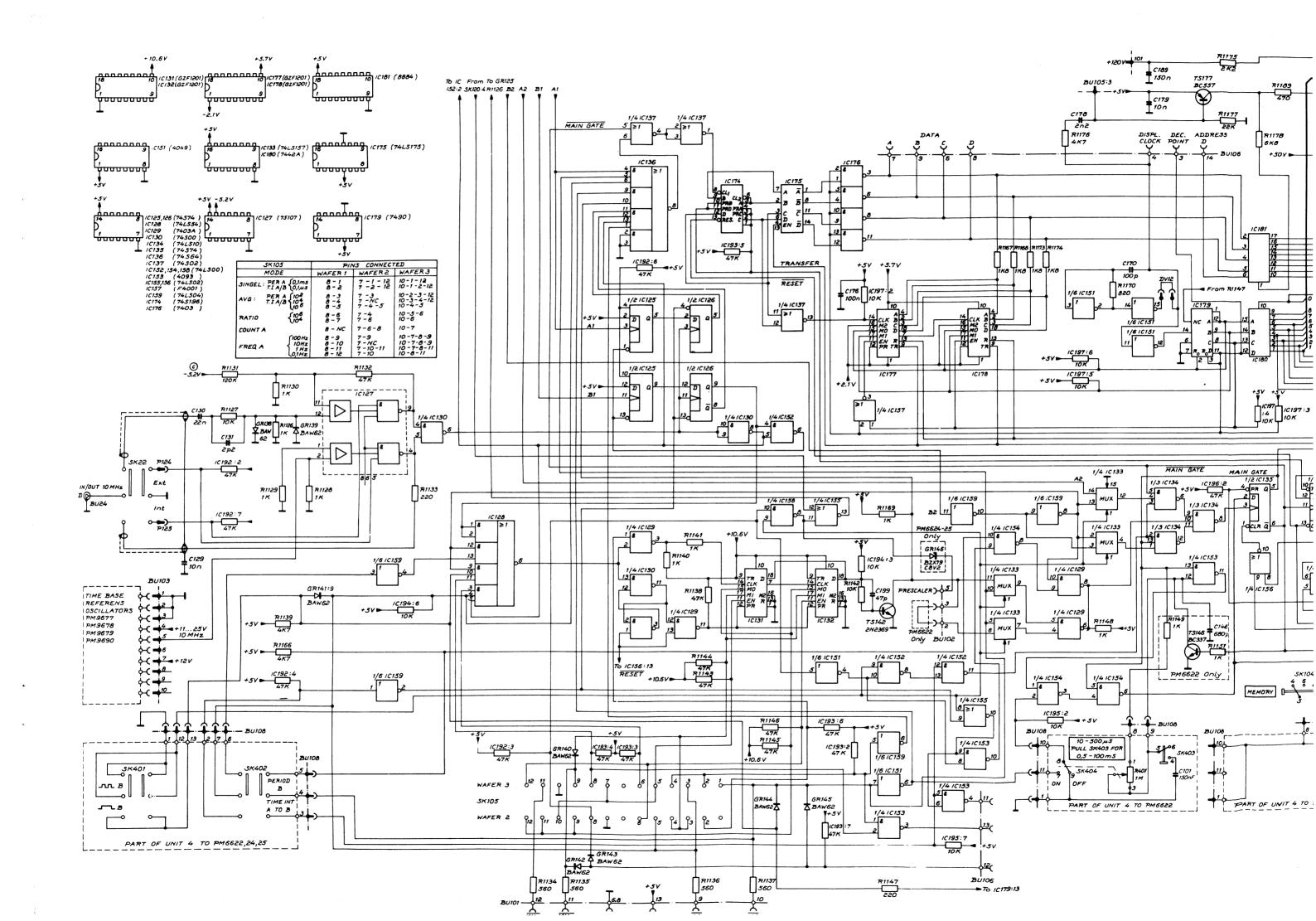
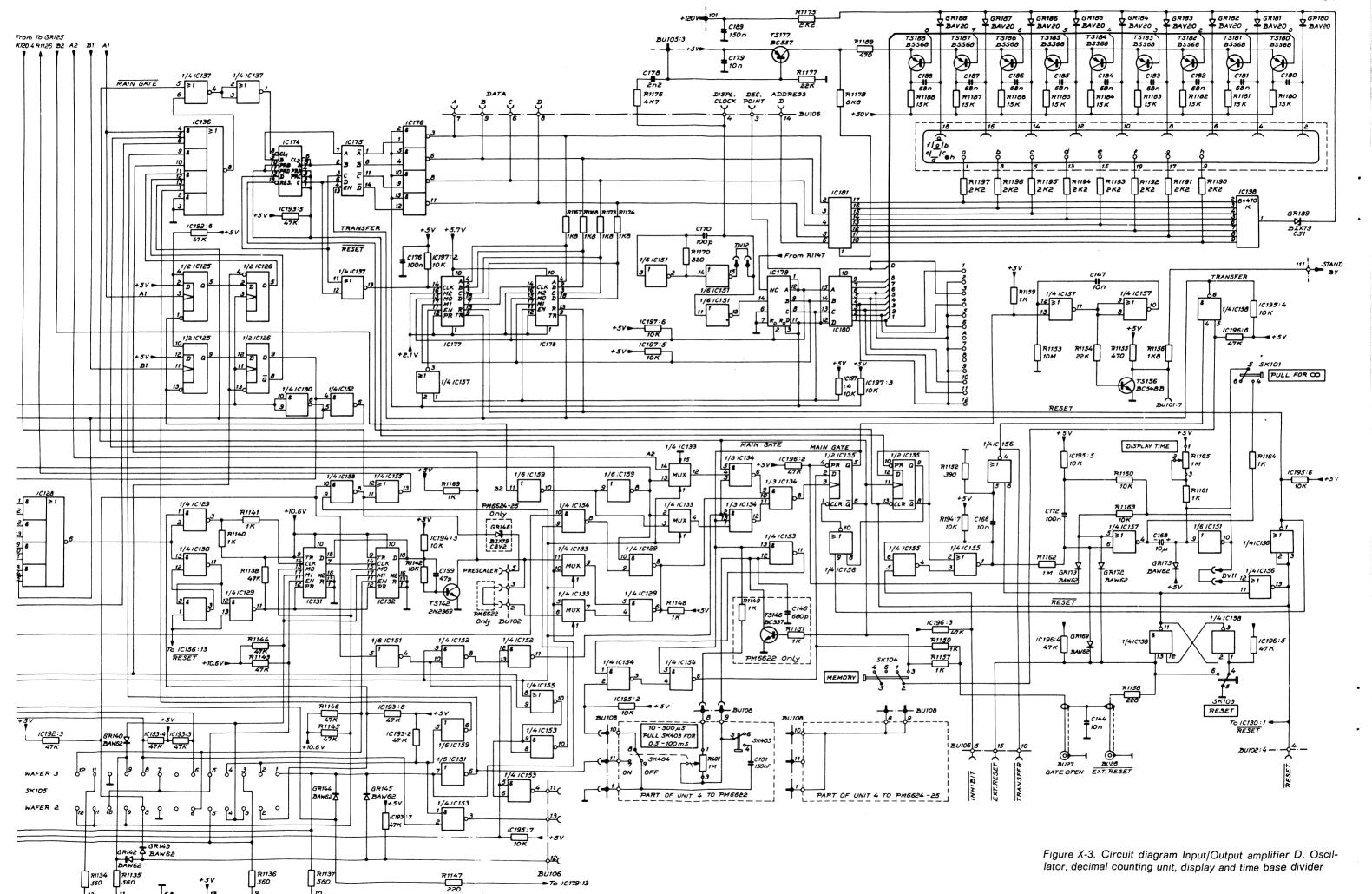
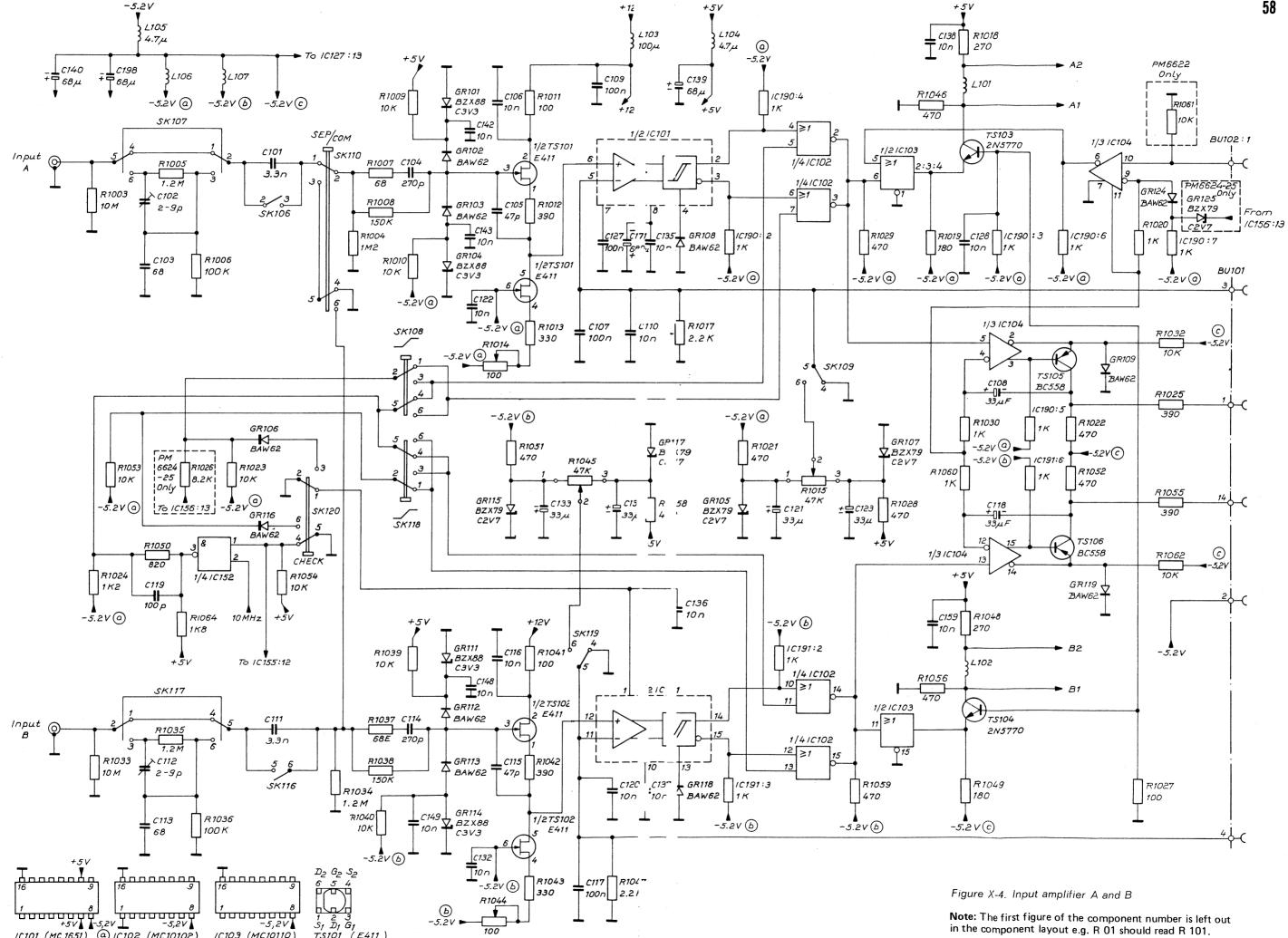


Figure X-2. Component layout U!

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1C101 (MC 1651) (A) 1C102 (MC10102)

TS101 (E411) TS102 (E411)

1C103 (MC10110)

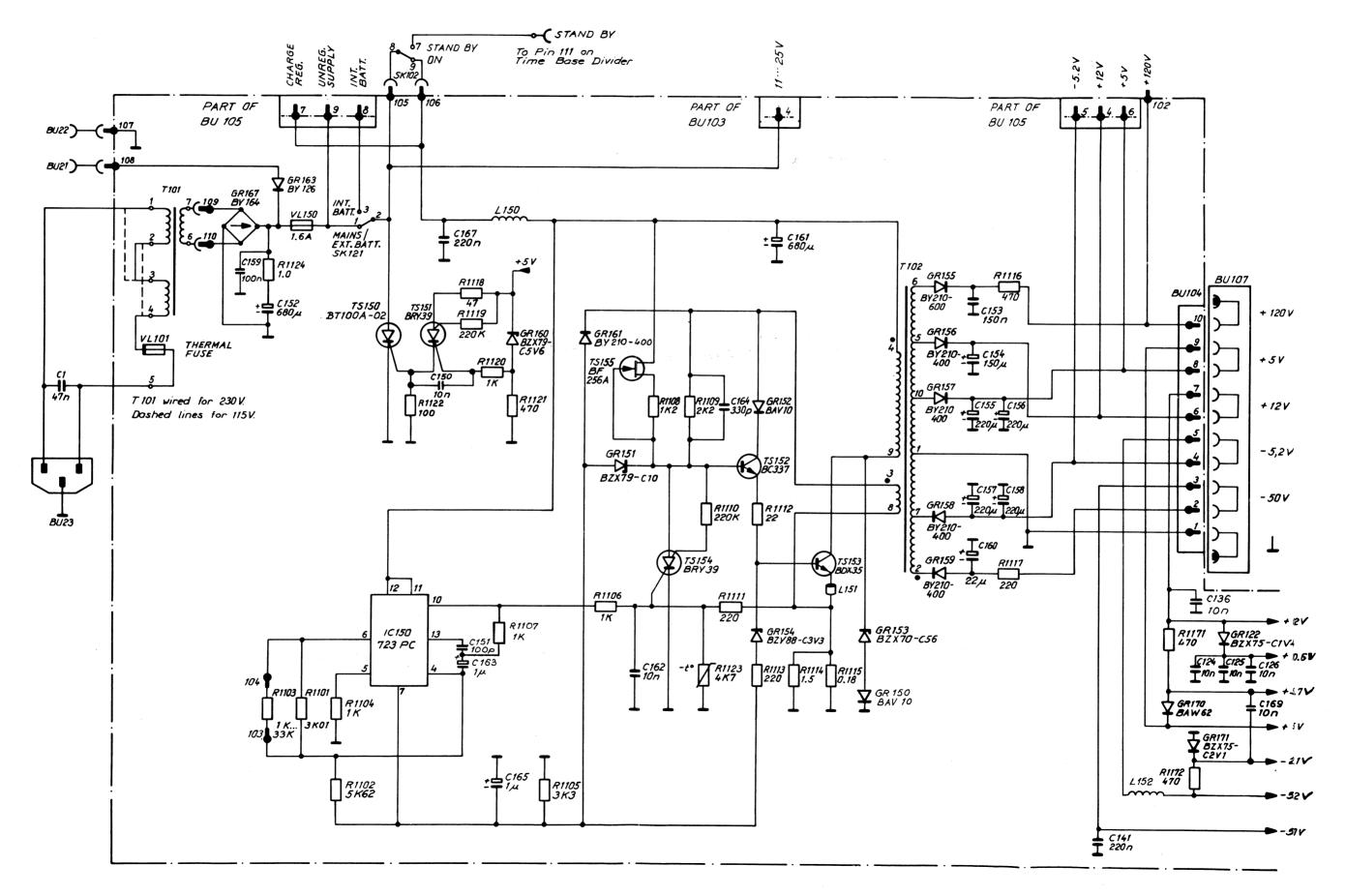


Figure X-5. Power supply

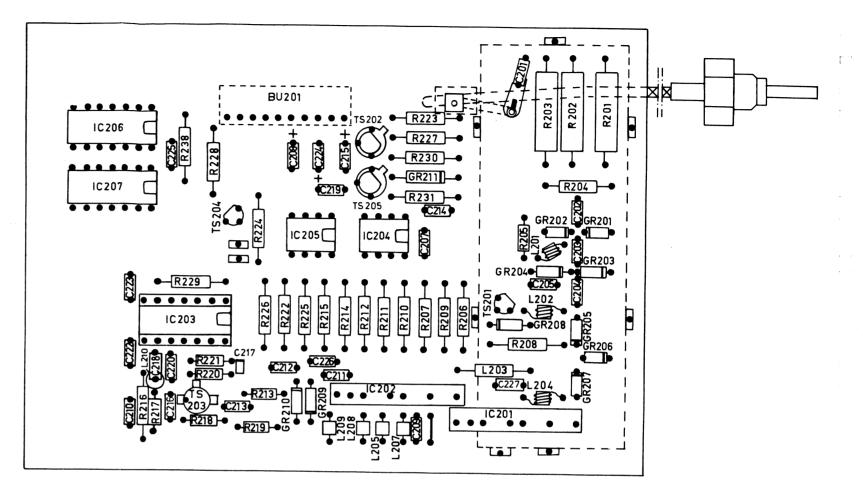


Figure X-6. Component layout prescaler PM 6624, Component side

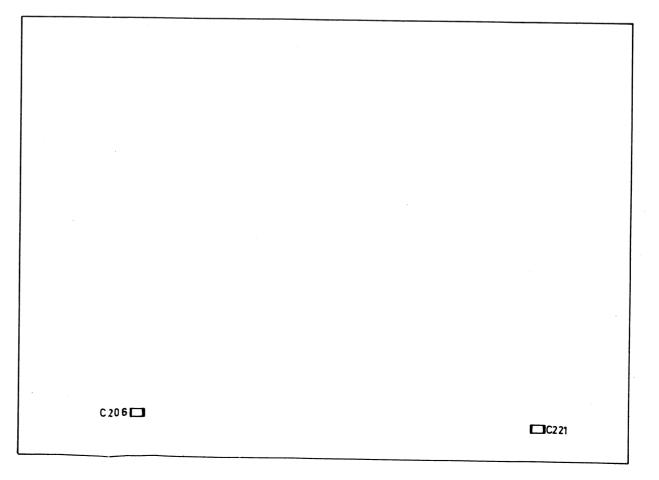
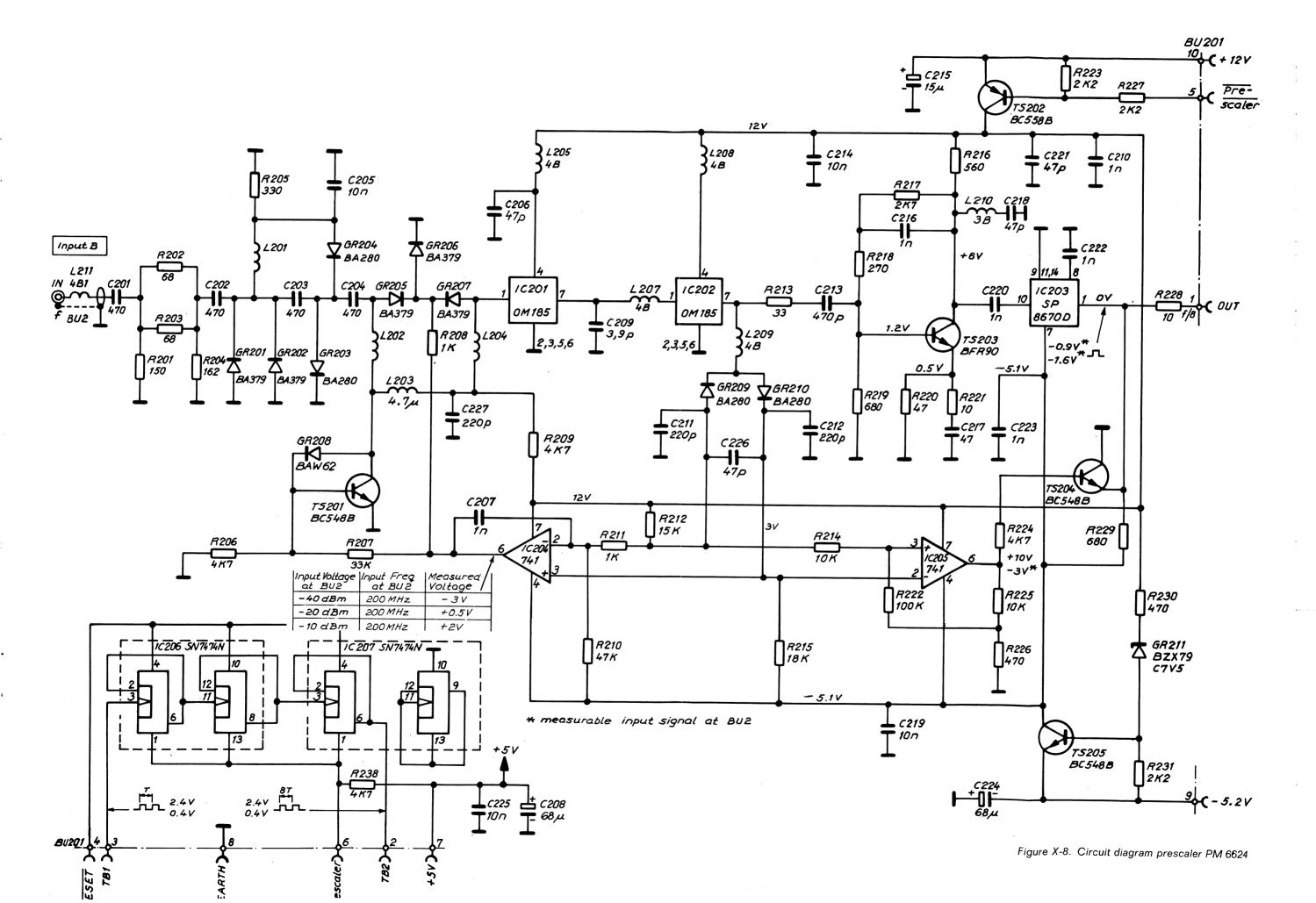


Figure X-7. Component layout prescaler PM 6624, Soldering



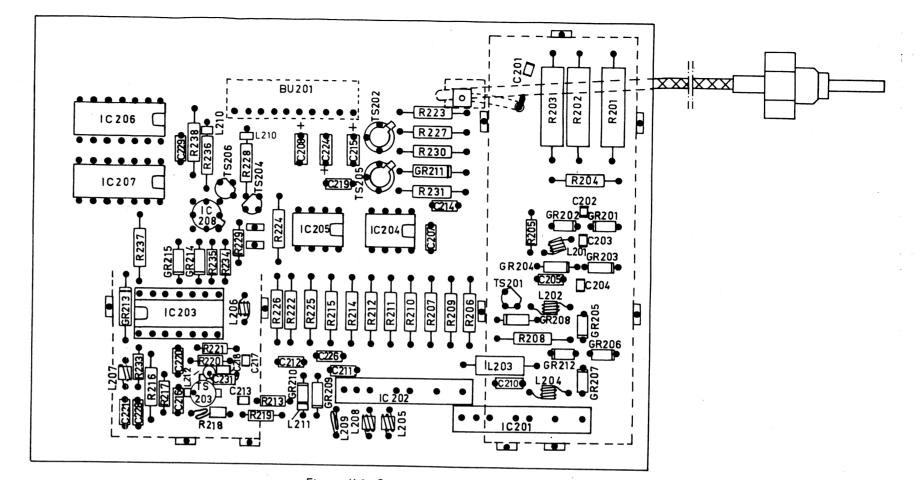


Figure X-9. Component layout prescaler PM 6625, Component side

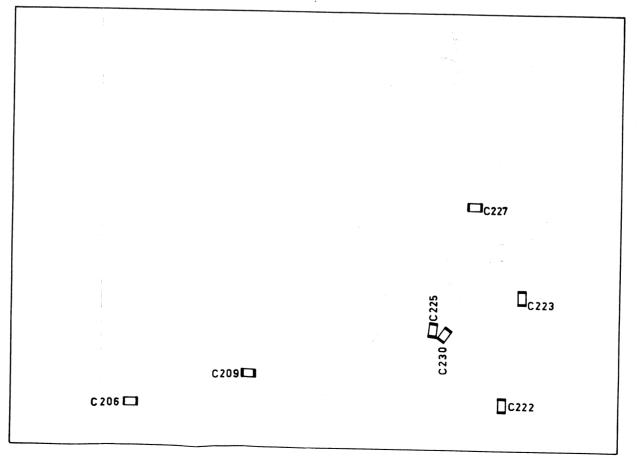


Figure X-10. Component layout prescaler PM 6625, Soldering side

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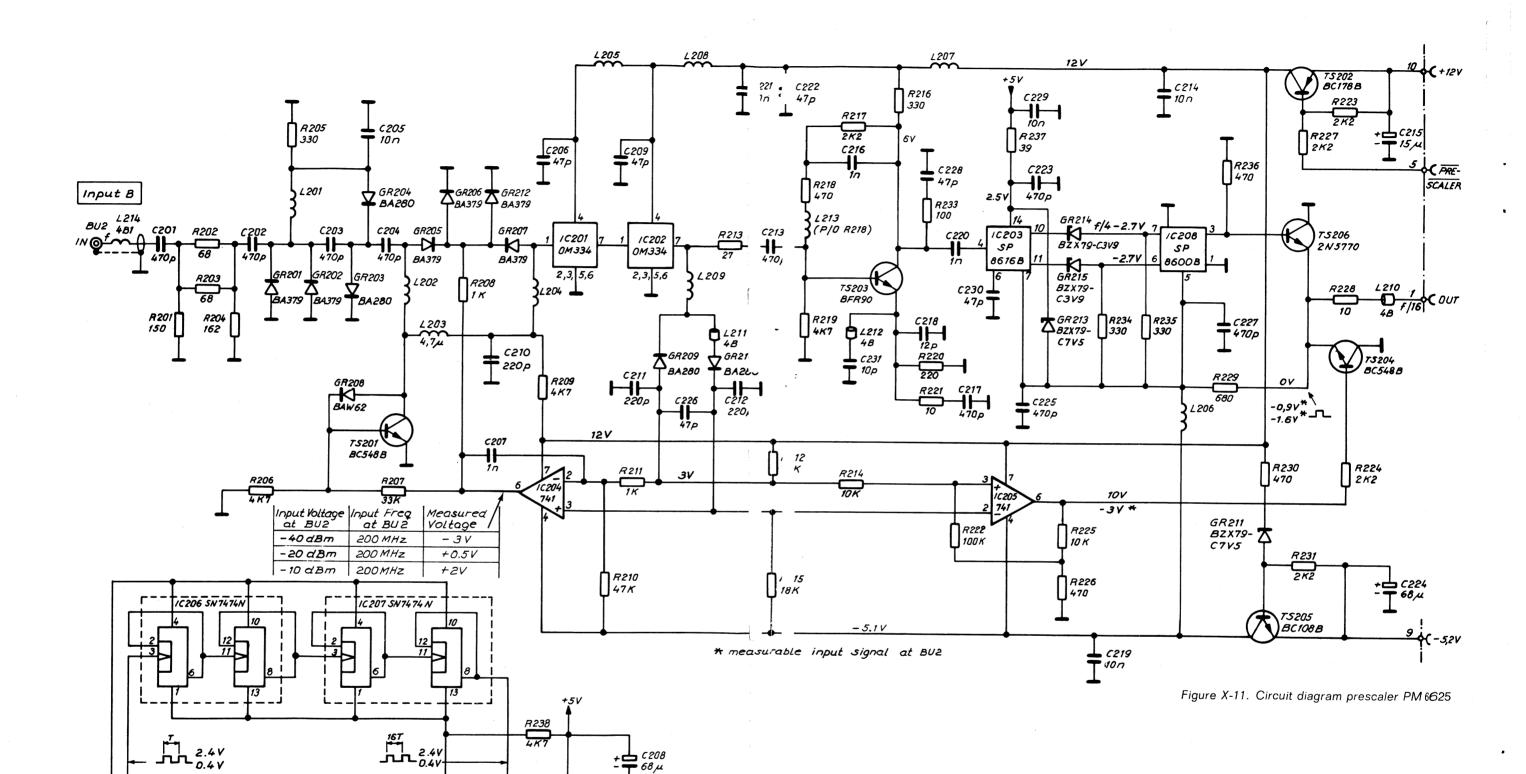
#### QUALITY REPORTING

#### CODING SYSTEM FOR FAILURE DESCRIPTION

The following information is meant for Philips service workshops only and serves as a guide for exact reporting of service repairs and maintenance routines on the workshop charts.

For full details reference is made to Information G1 (Introduction) and Information Cd 689 (Specific information for Test and Measuring Instruments).

#### LOCATION COMPONENT/SEQUENCE NUMBER ПП ПППП Unit number Enter the identification as used in the circuit diagram, e.g. 000A or 0001 (for unit A or 1; not 00UA e.g.: or 00U1) GR1003 Diode GR1003 or: Type number of an accessory (only if delivered TS0023 Transistor TS23 with the equipment) IC0101 Integrated circuit IC101 e.g. 9051 or 9532 (for PM 9051 or PM 9532) R0.... Resistor, potentiometer or: Unknown/Not applicable C0.... Capacitor, variable capacitor 0000 B0.... Tube, valve LA.... Lamp VL.... Fuse SK.... Switch BU.... Connector, socket, terminal T0.... Transformer L0.... Coil X0.... Crystal CB.... Circuit block RE.... Relay BA.... Battery TR.... Chopper **CATEGORY** Parts not identified in the circuit diagram: 990000 Unknown/Not applicable 0 Unknown, not applicable (fault not present, 990001 Cabinet or rack (text plate, emblem, grip, intermittent or disappeared) rail, graticule, etc.) 1 Software error 990002 Knob (incl. dial knob, cap, etc.) 2 Readjustment 990003 Probe (only if attached to instrument) 3 Electrical repair (wiring, solder joint, etc.) 990004 Leads and associated plugs 4 Mechanical repair (polishing, filing, remachining, etc.) 990005 Holder (valve, transistor, fuse, board, etc.) 5 Replacement 990006 Complete unit (p.w. board, h.t. unit, etc.) 6 Cleaning and/or lubrication Accessory (only those without type number) 990007 7 Operator error 990008 Documentation (manual, supplement, etc.) 8 Missing items (on pre-sale test) 990009 Foreign object 9 Environmental requirements are not met 990099 Miscellaneous



BU201-

PRE->

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72VX

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# **PHILIPS**





PM 6622

Instruction manual

**Anleitung** 

Notice d'emploi et d'entretien



PM 6624 9446 066 240.1



PM 6625

#### **IMPORTANT**

In correspondence concerning this instrument, please quote the type number and the serial number as given on the type plate on the rear of the instrument.

#### **WICHTIG**

Bei Schriftwechsel dieses Gerät betreffend, bitte die auf dem Typenschild an der Geräterückseite angegebene Typ- und Seriennummer zu vermelden.

#### **IMPORTANT**

Dans votre correspondance et dans vos réclamations se rapportant à cet appareil, veuillez toujours indiquer le numéro de type et le numéro de série qui sont marqués sur la plaquette signalétique.

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Installation	10	Installation	10	Installation	11	
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Operation	19	Betrieb	19	Mise en service	19	
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#### Safety regulations

Upon delivery, the instrument complies with the required safety regulations. To maintain this condition and to ensure safe operation, it is recommended to follow the instructions below.

#### 1. Before switching on

Protection The instrument is protected according to class 1 (protective earth) of the IEC 348 or VDE 0411. The mains cable provides earth connection. Outside specially protected rooms, the mains plug must be connected only to sockets with earthed contact. It is not allowed to interrupt the earth connection inside or outside the instrument.

**Mounting** The instrument may be used in any desired position. Do not place the instrument on any surface which produces or radiates heat, or in direct sunlight.

Earthing The instrument must be earthed in conformity with the local safety regulations. The mains cable delivered with the instrument includes a protective conductor, which is connected to the earth contacts of the plug. Thus, when connected to an earthed mains socket, the cabinet of the instrument is consequently connected to the protective earth. The circuit earth is connected internally to the external BNC socket and the cabinet. The BNC socket must not be used to connect a protective conductor. Warning Connect the mains cable plug only to a socket with protective earth contacts. This protection must not be ineffective e.g. by using an extension cable without earth protection.

Mains connection The instrument must be connected only to an AC supply. On delivery the instrument is set to 230 V or 115 V indicated on the plate at the rear of the instrument. Ensure that the instrument is set to the local mains voltage before switching on.

Mains connection must be made in accordance with the local safety regulations. This implies that the instrument is connected to the mains socket with a protective earth contact as described in section Earthing.

Mains Adjustment and Fuses The instrument can be set to 115 V or 230 V. In both cases the fuse should be 1.6 A fast action, in addition to this the primary side of the mains transformer is protected by a replacable thermal fuse. To convert the instrument proceed as follows:

- Unplug the mains cable
- Dismantle the instrument as described in section dismantling
- Resolder the wires of the mains transformer as shown on page 10.

#### 2. Maintenance and Repair

Failure and Extensive Stress If the instrument is suspected of being unsafe take it out of operation. This is the case when the instrument shows physical damage or does not function anymore or is stressed beyond the tolerable limits e.g. during storage or transportation.

Dismantling the instrument When removing covers or other parts by means of tools, live parts or terminals could be exposed. Before opening the instrument, disconnect it from all power sources. If the open live instrument needs calibration, maintenance or a repair, it must be performed only by trained personnel being aware of the risks. After disconnection from all power sources, the capacitors in the instrument may remain charged for some seconds, observe the circuit diagrams. To dismantle the instrument proceed as follows:

- Unplug the mains cable
- Loosen the four rear screws
- Remove top and bottom covers

Repair and replacing parts Repairs must be made by trained personnel. Ensure that the construction of the instrument is not altered to the detriment of safety. Above all, leakage paths, air gaps and insulation layers must not be reduced. When replacing, use only original parts. Other spare parts are only acceptable when the safety precautions for the instrument are not impaired.

#### Schutzmassnahmen

Dieses Gerät entspricht bei der Werksauslieferung den geltenden Schutzvorschriften. Zur Erhaltung dieses Zustands und zur Gewährleistung der Betriebssicherheit wird die genaue Einhaltung nachstehender Hinweise empfohlen,

#### 1. Vor der Inbetriebnahme

Schutzart Das Gerät entspricht der Schutzklasse I (Schutzleiteranschluss) gemäss IEC 348 bzw. VDE 0411. Die Geräteanschlussleitung enthält einen Schutzleiter. Ausser in Räumen mit besonderen Schutzmassnahmen darf das Gerät nur an Steckdosen mit Schutzkontakten (Schuko-Steckdosen) angeschlossen werden. Jede Unterbrechung des Schutzleiters innerhalb oder ausserhalb des Geräts ist unzulässig.

Aufstellung Das Gerät ist für jede Betriebslage vorgesehen. Wärmeeinwirkung und direkte Sonneneinstrahlung sind zu vermeiden.

Erdung Das Gerät ist nach Massgabe der örtlichen Vorschriften zu erden. Der Schutzleiter der Geräteanschlussleitung ist an die Schutzkontakte des Steckers angeschlossen. Auf diese Weise ist das Gehäuse des Geräts zwangsläufig mit Erde verbunden. Das Masse-Potential steht mit der äusseren BNC-Buchse und dem Gehäuse in Verbindung. Der Anschluss des Schutzleiters an die BNC-Buchse ist nicht zulässig. Zu beachten! Netzstecker nur an Schuko-Steckdosen anschliessen. Diese Schutzmassnahme darf nicht unwirksam gemacht werden (z B durch Verwendung einer Verlängerungsschnur ohne Schutzleiter).

Netzanschluss Das Gerät ist nur für Betrieb an Wechselspannung vorgesehen. Werksmässig ist es auf die Spannung 230 V oder 115 V eingestellt (Typenschild auf der Geräterückwand beachten!). Bei Bedarf also erst auf die örtliche Netzspannung umschalten. Der Netzanschluss muss den örtlichen Schutzvorschriften entsprechen. In jedem Fall ist aber Anschluss über eine Steckvorrichtung mit Schutzkontakten erforderlich; siehe oben under »Erdung».

Spannungswahl und Sicherungen Das Gerät ist auf 115 V oder 230 V einstellber. In beiden Fällen sind flinke Sicherungen 1,6 A zu verwenden. Die Primärseite des Netztransformators ist zusätzlich durch eine auswechselbere Thermosicherung geschützt. Die Umschaltung wird wie folgt vorgenommen:

- Netzstecker ziehen
- Gehäuse abnehmen (siehe unten)
- Die Drähte am Netztransformator entsprechend der Skizze auf Seite 10 umlöten

#### 2 Wartung und Reparatur

Fehler und Überbeanspruchung Bei Verdacht der Betriebsunsicherheit Gerät aus dem Betrieb nehmen. Dies kann der Fall sein bei sichtbaren Beschädigungen, Funktionsausfall oder übermässigen Beanspruchungen (Transport, Lagerung und dgl.).

Abnehmen des Gehäuses Beim Entfernen von Abdeckungen und Bauteilen können unter Spannung stehende Teile freigelegt werden. Vor dem Öffnen ist das Gerät daher von allen Spannungsquellen zu trennen. Abstimmung, Wartung oder Reparaturen unter Spannung dürfen nur von geschulten Fachkräften, die mit den Gefahren vertraut sind, vorgenommen werden. Zu beachten! Auch nach Spannungsunterbrechung sind geladene Kondensatoren noch für einige Zeit spannungführend (Schaltplan beachten!). Gehäuse wie folgt abnehmen:

- Netzstecker ziehen
- Die vier hinteren Schrauben lösen
- Gehäuseteile oben und unten abnehmen

Reparaturen und Auswechslung von Teilen Reparaturen sind nur von Fachkräften auszuführen. Die Bauweise des Geräts darf unter keinen Umständen für den Geräteschutz nachteilig geändert werden. Insbesondere dürfen die Kriechstrecken, Sicherheitsabstände und Isolierschichten keinesfalls beeinträchtigt werden. Nur Originalersatzteile verwenden! Andere Ersatzteile sind nur zulässig, sofern sich daraus beine Nachteile für den Geräteschutz ergeben

#### Prescriptions de sécurité

A la livraison, cet appareil satisfait aux normes de sécurité en vigueur. Afin de le maintenir conforme à ces normes et d'assurer son fonctionnement dans de bonnes conditions de sécurité, il est recommandé de se conformer aux instructions ci-dessous.

#### 1. Avant la mise en marche

Protection L'appareil est protégé conformément à la classe 1 (ligne de terre protectrice) des normes IEC 348 ou VDE 0411. Son câble secteur comporte une connexion de terre. A l'extérieur des locaux spécialement protégés, ne connecter la fiche secteur qu'à des prises dotées d'un contact de terre. Toute interruption de la connexion de terre à l'intérieur ou à l'extérieur de l'appareil est proscrite.

Installation L'appareil peut être utilisé dans n'importe quelle position en fonction des besoins de l'utilisateur. Ne pas le placer sur une surface produisant ou rayonnant de la chaleur, ni à la lumière solaire directe.

Misse à la terre Mettre l'appareil à la terre conformément aux normes de sécurité locales en vigueur. Le câble secteur livré avec l'appareil comprend un conducteur protecteur relié aux contacts de terre de la fiche. Lorsqu'il est branché à une prise secteur avec terre, l'appareil a ainsi son coffret relié à la ligne de terre protectrice, laquelle est connectée intérieurement à la prise BNC externe du coffret. Ne pas utiliser cette dernière pour connecter un conducteur de protection.

Attention Ne brancher la fiche du câble secteur qu'à des prises dotées de contacts de terre. Ne pas neutraliser cette protection en utilisant par exemple un prolongateur sans conducteur de terre.

Branchement au secteur N'alimenter l'appareil qu'en courant alternatif. A sa livraison, il est couplé pour 230 V ou 115 V suivant l'indication de la plaquette placée à sa partie arrière. Bien s'assurer qu'il est couplé sur la tension secteur locale avant de le mettre en marche. La connexion de l'appareil au secteur devant être effectuée conformément aux normes locales de sécurité, elle doit comporter une ligne de terre protectrice comme décrit au chapitre Mise à la terre.

Sélection du secteur et fusibles L'appareil peut être couplé pour 115 V ou 230 V. Dans les deux cas le fusible doit être 1.6 à action rapide, en sus de ca le côté principal du transformateur secteur est protégé par un fusible thermique démontable. Pour modifier le couplage de l'appareil, procéder de la manière suivante:

- Débrancher le cable Secteur
- Ouvrir l'appareil comme décrit au chapitre Ouverture
- Ressouder les fils du transformateur Secteur Conformément aux figures à la page 10

#### 2. Maintenance et réparation

Défauts et contraintes sévères Si la sécurité de fonctionnement de l'appareil est jugée incertaine, le retirer du service. C'est notamment le cas lorsqu'il présente des dommages matèriels ou ne fonctionne plus ou encore a été soumis à des contraintes hors tolérances, par exemple lors de l'entreposage ou du transport.

Ouverture de l'appareil Lors de l'enlèvement des capots ou autres parties au moyen d'outils, des organes ou des bornes sous tension peuvent se trouver exposés. Avant d'ouvrir l'appareil, le déconnecter par conséquent de toute source d'alimentation. Si l'appareil ouvert et sous tension nécessite un calibrage, une opération de maintenance ou une réparation, ne confier le travail qu'à du personnel qualifié et conscient des risques encourus. Après déconnexion des sources d'alimentation, les condensateurs de l'appareil peuvent rester chargés pendant quelques secondes, voir les schémas de connexions. Pour ouvrir l'appareil, procéder de la manière suivante:

- Debrancher le câble Secteur
- Enlever les quatres vis du fond
- Tirer les coffrets du haut et du bas

Réparation et remplacement de pièces Les réparations doivent être affectuées par du personnel qualifié. S'assurer que la constitution de l'appareil n'est pas modifiée au détriment de la sécurité. Avant tout, les lignes de fuite, les entrefers et les revêtements isolants ne doivent pas être réduits. Pour tout échange, n'utiliser que des pièces détachées d'origine. Les autres pièces de rechange ne sont acceptables que si le niveau de sécurité de l'appareil reste inchange.

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#### 1. Introduction

The counters in the PM 6620-series have frequency ranges from dc up to 80 MHz, 520 MHz and 1 GHz respectively for the PM 6622, PM 6624 and PM 6625. All models can measure frequency, ratio, period, time interval and have a totalizing mode. Optional accessoires such as five different oscillators, a battery unit, a BCD output unit, a D/A converter and a BUS interface system extend the range of applica-

## 2. Technical data

Properties expressed in numerical values with statement of tolerances are guaranteed. Numerical values without tolerances are intended for information purposes only and indicate the properties of an average instrument. The numerical values hold good for the nominal mains voltage.

### Measurements

Frequency A

Range: dc to 80 MHz

Gate times: 10 ms, 100 ms, 1 s and

10 s

Resolution: 100 Hz, 10 Hz, 1 Hz and

0.1 Hz

Accuracy: ± 1 count ± time base error

Frequency C

Range PM 6624: 50 MHz to 520 MHz Range PM 6625: 50 MHz to 1000 MHz Gate times PM 6624: 10 ms, 100 ms, 1 s and 10 s automatically multiplied with prescaling factor 8

Gate times PM 6625: 10 ms, 100 ms, 1 s and 10 s automatically multiplied

with prescaling factor 16

Resolution: 100 Hz, 10 Hz, 1 Hz and

Accuracy: ± 1 count ± time base error

Single Period B

Range: 100 ns to 105 s (dc to 10 MHz)

Resolution: 100 ns and 100 µs

Accuracy: ± 1 count ± time base error

± trigger error\*

Frequency counted: 10 MHz and 10 kHz

Period Average B

Range: 1 Hz to 10 MHz

Periods averaged (N): 102, 104 and 106

Resolution: 100 ns

Ν

Accuracy: ± 1 count ± time base error

± trigger error\*/N.

Frequency counted: 10 MHz

### 1. Einleitung

Die Universalzähler der PM 6620-Serie eignen sich für Messungen in den Frequenzbereichen von Gleichspannung bis 80 MHz (PM 6622) bzw. 520 MHz (PM 6624) und 1 GHz (PM 6625). Mit allen Modellen ist die Messung von Frequenz, Frequenzverhältnis, Periodendauer, Zeitintervall sowie Ereigniszählung möglich. Der Anwendungsbereich kann durch Zusatzeinheiten wie fünf verschiedene Oszillatoren, eine Batterie-Einheit, einen BCD-Ausgang, einen D/A-Wandler und ein BUS-Interfacesystem noch wesentlich erweitert werden.

#### 2. Technische Daten

In Zahlen mit Toleranzangabe ausgedrückte Eigenschaften sind Garantiewerte. Zahlen ohne Toleranzangabe dienen nur zur Information des Anwenders und stellen die Eigenschaften eines typischen Gerätes dar. Die Zahlenwerte gelten für Nenn-Netzspannung.

#### Messarten

Frequenz A

Bereich: 0...80 MHz

Meßzeiten: 10 ms, 100 ms, 1 s und 10 s Auflösung: 100 Hz, 10 Hz, 1 Hz und

0.1 Hz

Genauigkeit: ± 1 digit ± Zeitbasis-

fehler

Frequenz C

Bereich PM 6624: 50 MHz . . . 520 MHz Bereich PM 6625: 50 MHz . . . 1000 MHz Meßzeiten PM 6624: 10 ms, 100 ms, 1 s und 10 s, automatisch multipliziert mit dem Vorteilerfaktor 8

Meßzeiten PM 6625: 10 ms, 100 ms, 1 s und 10 s. automatisch multipliziert mit dem Vorteilerfaktor 16.

Auflösung: 100 Hz, 10 Hz, 1 Hz und 0,1 Hz

Genauigkeit: ± 1 digit ± Zeitbasisfehler

#### Einzelperiode B

Bereich: 100 ns . . . 105 s (0 . . . 10 MHz) Auflösung: 100 ns und 100 µs Genauigkeit: ± 1 digit ± Zeitbasis-

fehler ± Triggerfehler\*

Zählfrequenz: 10 MHz und 10 kHz

### Periodendauer-Mittelwert B

Bereich: 1 Hz...10 MHz

Mittelwertbildung über N Perioden:

10<sup>2</sup>, 10<sup>4</sup> und 10<sup>6</sup> Auflösung: 100 ns

#### 1. Introduction

Les compteurs PM 6622, PM 6624, PM 6625 de la série PM 6620, offrent respectivement, des gammes de fréquence du continu à 80 MHz, 520 MHz, et

Ils permettent tous trois de mesurer la fréquence, le rapport, la période l'intervalle de temps, et sont équipés d'un mode de totalisation. Les accessoires en option, tels que : cinq oscillateurs différents, une unité de batterie, une unité de sortie BCD, un convertisseur D/A et un interface BUS, permettent d'étendre la gamme d'applications.

## 2. Caractéristiques **Techniques**

Les caractéristiques exprimées valeurs numériques avec mention de tolérances sont garanties. Les valeurs numériques sans mention de tolérance sont données à titre indicatif seulement, et ce, pour la moyenne des appareils. Les valeurs numériques sont valables pour une tension secteur nominale.

#### Mesures

Fréquence A

Gamme: continu à 80 MHz

Temps de porte : 10 ms, 100 ms, 1 s et

Résolution: 100 Hz, 10 Hz, 1 Hz et

0.1 Hz

Précision: ± 1 impulsion ± erreur de base de temps

Fréquence C

Gamme PM 6624: 50 MHz à 520 MHz Gamme PM 6625 : 50 MHz à 1000 MHz Temps de porte PM 6624 : 10 ms,

100 ms, 1 s, et 10 s multipliés - automatiquement avec facteur de pré-étalonnage 8

Temps de porte PM 6625 : 10 ms.

100 ms. 1 s et 10 s multipliés - automatiquement avec facteur de pré-étalonnage 16

Résolution: 100 Hz, 10 Hz, 1 Hz, et

0.1 Hz

Précision: ± 1 impulsion ± erreur de

base de temps

Période simple B

Gamme: 100 ns à 105 s (continu à

10 MHz)

Résolution: 100 ns et 100 µs

Précision: ± 1 impulsion ± erreur de base de temps ± erreur de déclenchement\*

Fréquence comptée : 10 MHz et 10 KHz

#### Single Time Interval A to B

Range: 100 ns to 105 s Resolution: 100 ns and 100 us

Time interval repetition rate: maximum

5 MHz

Accuracy: ± 1 count ± time base error

± trigger error\*\*

Frequency counted: 10 MHz and 10 kHz

#### Time Interval Average A to B

Range: 1 ns to 1 s

Frequency counted: 10 MHz

Periods averaged (N): 102, 104 and 106 Statistical resolution: 100 ns/ $\sqrt{N}$ Minimum time from stop to start: 250 ns Accuracy:  $\pm 4$  ns  $\pm$  time base error

100 ns trigger error\*\*

 $\sqrt{N}$ 

Time Interval repetition rate: maximum 4 MHz

### Count A (totalizing)

Range: 1 to 109

Mode: accumulates pulses between a start and stop pulse or during a gate

signal applied to input B Pulse pair resolution: 12 ns

#### **Multiple Ratio**

dc to 80 MHz Ratio fA/fB: dc to 10 MHz

50 to 520 MHz Ratio fC/fB PM 6624:

dc to 10 MHz

50 to 1000 MHz Ratio fC/fB PM 6625: 10 MHz dc to

Accuracy: ±1 count ± trigger error\* of B/N

Multiplier (N): 104 and 106 with correct decimal point

Ratio measurements with a multiplier factor:  $N = 10^5$  to  $10^8$  are obtained in Frequency measurements. In Single Period and Period Average measurements multiplier factors of 1, 102, 104 and 106 can be obtained by using the external reference input.

This arrangement will not give correct decimal points.

#### Trigger Hold Off only PM 6622

Measuring modes: the trigger hold off (or trigger delay) works in Single Period and Single Time Interval modes. Range: from less than 10  $\mu s$  to 100 ms in two ranges.

Monitor output: the hold off time is

\* Trigger error is  $\leq \pm 3 \times 10^{-3}$  for sine wave signals with signal to noise ratio of  $\geq$  40 dB.

Trigger error for any wave shape is  $2.5 \times 10^{-3}$ Signal slope (V/ns)

Genauigkeit: ± 1 digit ± Zeitbasis-

fehler ± Triggerfehler\*/N Zählfreguenz: 10 MHz

#### Einzelzeitintervall A-B

Bereich: 100 ns . . . 105 s Auflösung: 100 ns und 100 us Zeitintervall-Wiederholfrequenz: max.

5 MHz

Genauigkeit: ± 1 digit ± Zeitbasis-

fehler ± Triggerfehler\*

Zählfrequenz: 10 MHz und 10 kHz

#### Zeitintervall-Mittelwert A-B

Bereich: 1 ns...1 s Zählfreguenz: 10 MHz

Mittelwertbildung über N Perioden:

10<sup>2</sup>, 10<sup>4</sup> und 10<sup>6</sup>

Statistische Auflösung:

#### Mindestzeit zwischen Start und Stopp: 250 ns

Genauigkeit: ± 4 ns ± Zeitbasisfehler 100 ns ± Triggerfehler\*\*

 $1/\overline{N}$ 

Zeitintervall-Wiederholfrequenz: max. 4 MHz

#### Zählung A (Summenbildung)

Bereich: 1...109

Betrieb: Summiert Impulse zwischen einem Start- und einem Stoppsignal oder während eines Torsignals an Eingang B

Impulspaar-Auflösung: 12 ns

#### Frequenzverhältnis

Verhältnis fA/fB:

DC ... 80 MHz/DC ... 10 MHz Verhältnis fC/fB (PM 6624):

50 . . . 520 MHz/DC . . . 10 MHz

Verhältnis fC/fB (PM 6625):

50 . . . 1000 MHz/DC . . . 10 MHz

Genauigkeit: ± 1 digit ± Triggerfehler\* von B/N

Multiplikator (N): 104 und 106 mit korrektem Dezimalpunkt

Verhältnismessung mit einem Multiplikator:  $N = 10^5$  bis  $10^8$  sind im Frequenz-Betrieb zu erhalten, während bei Messung von Periodendauer und Periodendauer-Mittelwert die Multiplikatoren 1, 102, 104 und 106 durch Verwendung des externen Referenzeingangs erhältlich sind.

Dieses Verfahren liefert jedoch keinen korrekten Dezimalpunkt.

Der Triggerfehler beträgt höchstens  $\pm$  3 imes 10<sup>-3</sup> für Sinus bei einem Signal-Rauschverhältnis von min. 40 dB.

Der Triggerfehler für beliebige Signalformen beträgt höchstens

 $2.5 \times 10^{-3}$ Signalflanke (V/ns)

#### Période movenne B

Gamme: 1 Hz à 10 MHz

Périodes mises en moyenne (N): 10<sup>2</sup>, -

104 et 106

Résolution: 100 ns

Précision: ± 1 impulsion ± erreur de base de temps ± erreur de déclenche-

ment\*/N

Fréquence comptée : 10 MHz

#### Intervalle de temps simple A — B

Gamme: 100 ns à 105 s Résolution: 100 ns et 100 us Taux de répétition d'intervalle de

temps: Maximal de 5 MHz

Précision: ± 1 impulsion ± erreur de base de temps ± erreur de déclenchement\*\*

Fréquence comptée : 10 MHz et 10 KHz

## Moyenne d'intervalle de temps

Gamme: 1 ns à 1 s

Fréquence comptée : 10 MHz

Périodes mises en moyenne (N): 102,

104 et 106

Résolution statistique : 100 ns/ $\sqrt{N}$ Temps minimal arrêt/démarrage :

250 ns

Précision: ± 4 ns ± erreur de base de temps ± 100 ns erreur de déclenchement\*\*/1/N

Taux de répétition d'intervalle de temps: Maximal de 4 MHz

#### Comptage A (totalisation)

Gamme: 1 à 109

Mode: accumule les impulsions pendant l'intervalle de temps entre le signal d'arrêt ou le signal de porte appliqué à l'entrée B

Résolution de paire d'impulsions : 12 ns

#### Rapport multiple

Rapport fA/fB:

continu à 80 MHz, continu à 10 MHz Rapport fC/fB PM 6624:

50 à 520 MHz, continu à 10 MHz

Rapport fC/fB PM 6625:

50 à 1000 MHz, continu à 10 MHz Multiplicateur (N): 104 et 106 avec le point décimal correcte

Précision: ∓ 1 impulsion ∓ erreur\* de déclenchement de B/N.

L'erreur de déclenchement est ≤±3×10<sup>-3</sup> pour signaux sinus oïdaux avec rapport signal/bruit ≥40 dB.

L'erreur de déclenchement pour chaque sinusoīde est ≤±

 $2,5 \times 10^{-3}$ pente du signal (V/ns)

monitored on the Gate Open output and can be digitally measured by the instrument itself.

#### Check

Hold off not activated: 10 MHz is internally applied to channels A and B and a functional self test of any measuring mode can be made.

Hold off activated: the set Hold Off duration will be displayed if Single Period or Time Interval mode is selected.

### Input characteristics

#### Inputs A and B

**General:** inputs A and B are identical but input B is functionally limited to 10 MHz

Frequency range: dc to 80 MHz at dc coupling and 100 Hz to 80 MHz at ac coupling

Rise time: approximately 4 ns

**Pulse resolution:** 6 ns minimum pulse duration

Sensitivity: 20  $\rm mV_{rms}$  and 200  $\rm mV_{rms}$  for sine wave signals, 60  $\rm mV_{p-p}$  and

600 mV<sub>p-p</sub> for pulses Impedance: 1 M $\Omega$ //25 pF

Trigger level: preset to 0 V or variable between  $\pm 2.5$  V and  $\pm 25$  V in two ranges with higher resolution around 0 V

Trigger level monitor: set trigger voltages from — 2.5 V to + 2.5 V are available on 1 mm jacks at the front

Trigger slope: positive and negative Coupling: dc and ac

Safe overload at 20 mV sensitivity setting: 250 V dc or 230  $V_{\rm rms}$  for frequencies up to 440 Hz falling to 12  $V_{\rm rms}$  for frequencies of 1 MHz and higher

Safe overload at 200 mV sensitivity setting: 250 V dc or 230 V<sub>rms</sub>
Switching mode: separate or common

#### Input C

Range: 50 MHz to 520 MHz for PM 6624 and 50 MHz to 1000 MHz for PM 6625 Prescaling factor: 8 for PM 6624 and 16 for PM 6625

Dynamic input voltage range: 10 mV $_{\rm rms}$  to 12 V $_{\rm rms}$  (— 27 dBm to + 35 dBm). Above 960 MHz the sensitivity of PM 6625 might drop to — 24 dBm (14 mV $_{\rm rms}$ )

Impedance:  $50\Omega$ 

**Attenuation:** continuous by automatic PIN diode attenuation, maximum 62 dB

Coupling: ac VSWR: less than 2

AM tolerance: 98 % at modulation frequencies up to 5 kHz. 30 % at modulation frequencies of 1 MHz and higher. Safe overload: 12  $V_{\rm rms}$ 

#### Triggersperre (nur PM 6622)

**Betrieb:** Die Triggersperre (Triggerverzögerung) HOLD OFF arbeitet bei Messungen von Einzelperioden und Einzelzeitintervall.

Bereich: Von unter 10  $\mu s$  bis 100 ms in zwei Bereichen.

Anzeige: Die Sperre wird am Ausgang GATE OPEN angezeigt und kann vom Instrument selbst digital gemessen werden.

#### Check

Triggersperre nicht betätigt: Ein 10-MHz-Signal wird intern an die Kanäle A und B angelegt. Dadurch ist eine funktionelle Eigenkontrolle jeder Meßfunktion möglich.

Triggersperre betätigt: Bei Messung von Periodendauer oder Zeitintervall wird die eingestellte Dauer der Triggersperre HOLD OFF angezeigt.

## Eingangscharakteristika

#### Eingänge A und B

Allgemeines: Die Eingänge A und B sind identisch, nur ist die Funktion von Eingang B auf 10 MHz begrenzt.

Frequenzbereich: DC bis 80 MHz bei DC-Kopplung und 100 Hz bis 80 MHz bei AC-Kopplung

Anstiegszeit: ca. 4 ns

**Impulsauflösung:** min. Impulsdauer 6 ns **Empfindlichkeit:** 20 mV<sub>eff</sub> und

200 mV $_{\rm eff}$  für Sinussignale, 60 mV $_{\rm SS}$ 

und 600  ${\rm mV_{SS}}$  für Impulse Impedanz: 1 M $\Omega$ //25 pF

**Triggerpegel:** Voreingestellt auf 0 V oder variabel zwischen  $\pm$  2,5 V und  $\pm$  25 V mit höherer Auflösung um 0 V

**Triggerpegelanzeige:** Eingestellte Triggerspannungen von — 2,5 V bis

+ 2,5 V können an Miniaturbuchsen auf der Frontseite abgenommen werden

Triggerflanke: Positiv und negativ Kopplung: DC und AC

Uberlastungsschutz bei 20 mV: 250 V DC oder 230  $V_{\rm eff}$  bei Frequenzen von bis zu 440 Hz, abfallend auf 12  $V_{\rm eff}$  bei 1 MHz oder mehr

Überlastungsschutz bei 200 mV: 250 V

DC oder 230 V<sub>eff</sub>

Schaltart: Gemeinsam oder getrennt

#### Eingang C

**Bereich:** 50 MHz bis 520 MHz (PM 6624) bzw. 50 MHz bis 1000 MHz (PM 6625)

Vorteilerfaktor: 8 für PM 6624 und 16 für PM 6625

Dynamischer Eingangsspannungs-

bereich: 10 mV $_{\rm eff}$  bis 12 mV $_{\rm eff}$  (— 27 dBm bis + 35 dBm). Über 960 MHz

Mesures de rapport avec un facteur multiplicateur :  $N=10^5$  à  $10^8$  sont obtenus en mesures de fréquence. Pour les mesures en Période Simple et Période moyenne les facteurs multiplicateurs de 1,  $10^2$ ,  $10^4$  et  $10^6$  peuvent être obtenus en utilisant une entrée de référence externe.

Toutefois, cet arrangement ne fournira pas de points décimaux correctes.

## Déclenchement HOLD OFF seulement PM 6622

Modes de mesures : le déclencheur Hold Off fonctionne en mode de — Période Simple et en mode d'intervalle de temps simple.

Sortie contrôle : le temps de retard est commandé sur la sortie de porte ouverte et peut être mesuré digitalement par l'instrument lui-même.

#### Vérification

Hold Off non-déclenché: 10 MHz est appliqué intérieurement aux voies A et B et un auto-contrôle fonctionnel peut être effectué selon n'importe quel mode de mesure

Hold Off Déclenché: la durée réglée de Hold Off sera affichée après la sélection de soit le mode de Période Simple, ou le mode d'intervalle de temps.

## Caractéristiques d'Entrée

#### Entrées A et B

Généralités : les entrées A et B sont identiques mais, l'entrée B est limitée à une fonction de 10 MHz

Gamme de fréquence : continu à 80 MHz avec couplage en continu, et — 100 Hz à 80 MHz avec couplage capacitif

Temps de montée : approximat∨ement 4 ns

Résolution des impulsions : duré e minimum de 6 ns par impulsion

Sensibilité : 20 mV $_{\rm eff}$  et 200 mV $_{\rm eff}$  pour les signaux d'ondes sinus $\odot$ idales 60 mV $_{\rm c-c}$  et 600 mV $_{\rm c-c}$  pour les impulsions

Impédance: 1 M-ohm//25 pF

Niveau de déclenchement : préréglé sur 0 V ou variable entre ± 2.5 V et ± 25 V en deux gammes avec une résolution supérieure près de 0 ∨

Commande du niveau de dédenchement : des tensions de déclenchement réglées de — 2.5 V à + 2.5 V sont obtenues sur les bornes avant

Pente de déclenchement : positive et négative

Couplage: continu ou capacitil

#### External reference input D

General: channel D is switchable between external reference frequency input and internal reference oscillator output

Frequency range: 1 kHz to 10 MHz with correct decimal point at 10 MHz

Sensitivity: 500 mV<sub>rms</sub>

Impedance: approximately 10 k $\Omega$ 

Coupling: ac

Safe overload: 50 V<sub>rms</sub>

#### External reset and start

Reset: via a 0 V  $\pm$ 0.4 V signal applied

to the input socket

Minimum time between trailing edge and start of new measurement: 200 ns Minimum reset pulse duration: 100 ns Input current: at 0.4 V maximum 0.4 mA Start of new measurement: when the input is returned to a voltage of more than +2.5 V (max. 5.5 V) or left open the counter is released to carry out a new measurement. If the Display Time Control is set to infinite position only one new measurement is made and stored and the counter can not start a new measurement until a new reset pulse has been applied.

## **Output characteristics**

#### Time base oscillator output D

General: channel D is switchable between external reference frequency input and time base oscillator output

X-tal frequency: 10 MHz

Amplitude: approximately 1  $V_{\rm rms}$ , open

circuit

Impedance: approximately 200  $\Omega$ 

Coupling: dc

Safe overload: short circuit proof

#### Gate monitor output

General: the gate monitor output enables observation on an oscilloscope of the measured interval (and the hold off time on the PM 6622)

Output level during open main gate: less than 0.4 V

Output level during closed main gate: more than 2.5 V

Output level during hold off time:

approximately 1.5 V **Output impedance:** approximately

Delay: internal delay between the signal inputs and the trigger monitor out-

Overload protection: short circuit proof

## General characteristics

put is approximately 65 ns

#### Display

Read out: planar 9 digits 7 segments gas discharge display with automatic decimal point

kann die Empfindlichkeit des PM 6625 auf — 24 dBm (14 mV<sub>eff</sub>) abfallen

Impedanz: 50 Ω

Dämpfung: Kontinuierlich durch automatischen PIN-Dioden-Abschwächer,

max. 62 dB Kopplung: AC VSWR: Unter 2

AM-Toleranz: 98% bei Modulationsfrequenzen bis zu 5 kHz. 30% bei Modulationsfrequenzen von 1 MHz und mehr

Uberlastungsschutz: 12 Vett

#### Externer Referenzeingang D

Allgemeines: Der Kanal D ist umschaltbar zwischen externem Referenzfrequenz-Eingang und internem Referenz-Oszillator-Ausgang

Bereich: 1 kHz bis 10 MHz mit korrek-

tem Dezimalpunkt bei 10 MHz Empfindlichkeit: 500 mV $_{eff}$  Impedanz: ca. 10 k $\Omega$ 

Kopplung: AC

Uberlastschutz: 50 V<sub>eff</sub>

#### Externes Rückstell-/Startsignal

Rückstellung: über ein 0 ± 0,4 V-Signal am Eingang

Mindestzeit zwischen Rückflanke und Beginn der neuen Messung: 200 ns Min. Rückstellimpulsdauer: 100 ns Eingangsstrom: max. 0,4 mA bei 0,4 V Start einer neuen Messung: Wird der Eingang auf über + 2,5 V (max. 5,5 V) rückgestellt oder offen gelassen, so wird der Zähler für eine neue Messung freigegeben. Steht die Anzeigezeit auf unendlich, wird nur eine Messung durchgeführt und gespeichert. Der Zähler ist dann bis zum Anlegen eines neuen Rückstellsignals gesperrt.

## Ausgangscharakteristika

## Zeitbasis-Oszillator, Ausgang D

Allgemeines: Der Kanal D ist umschaltbar zwischen externem Referenzfrequenz-Eingang und internem Zeitbasis-Oszillator-Ausgang

Impedanz:  $200 \Omega$ Kopplung: DC

**Überlastschutz:** kurzschlussfest

#### Gate-Monitor-Ausgang

Allgemeines: Der Gate-Monitor-Ausgang ermöglicht es, das gemessene Zeitintervall (und die Triggerverzögerung beim PM 6622) auf einem Ozilloskop zu überwachen.

Ausgangspegel bei offenem Haupttor: unter 0,4 V

Ausgangspegel bei geschlossenem

Haupttor: über 2,5 V

Ausgangspegel während Triggerverzö-

gerung: ca. 1,5 V

Protection de surchage ; pour réglage de sensibilité à 20 mV : 250 V continu ou 230 V<sub>eff</sub> pour les fréquences montant jusqu'à 440 Hz, tombant ensuite à 12 V<sub>eff</sub> pour les fréquences de 1 MHz à monter

Protection de surcharge pour réglage de sensibilité à 200 mV : 250 V continu

ou 230 V<sub>eff</sub>

Modes d'entrée : séparée ou commune

#### Entrée C

**Gamme:** 50 MHz à 520 MHz pour PM 6624 et 50 MHz à 1000 MHz pour PM 6625

Facteur de pré-étalonnage: 8 pour PM 6624, et 16 pour PM 6625

PM 6624, et 16 pour PM 6625

Gamme de tension dynamique d'entrée:

10 mV<sub>eff</sub> à 12 mV<sub>eff</sub> (— 27 dBm à + 35 dBm). Audessus de 960 MHz la sensibilité pourrait baisser jusqu'à — 24 dBm, 14 mV<sub>eff</sub>

Impédance : 50 ohm

**Atténuation :** par atténuateur à diodes PIN automatique, 62 dB maximum

Couplage: capacitif

Taux d'ondes stationnaires (VSWR) :

< 2

Tolérance AM: 98 % en modulation de fréquence allant jusqu'à 5 kHz, 30 % en modulation de fréquence de 1 MHz à monter

Protection de surcharge : 12 Vett

#### Entrée de référence externe D

Généralité: la voie D est commutable entre l'entrée externe à fréquence de référence, et la sortie de l'oscillateur à référence interne

Gamme de fréquence : 1 kHz à 10 MHz avec point décimal correcte à 10 MHz

Sensibilité : 500 mV<sub>eff</sub> Impédance : approximativement 10 k-

ohm

Couplage: capacitif

Protection de surcharge : 50  $V_{eff}$ 

## Remise à zéro/Démarrage externe

Remise à zéro : via un signal de 0 V ± 0.4 V appliqué à l'entrée EXT. RESET Temps minimum entre la suite d'un affichage et le démarrage d'une nouvelle mesure : 200 ns

Durée minimum de l'impulsion de remise : 100 ns

Courant d'entrée : 0,4 mA max à 0,4 V Démarrage d'une nouvelle r∎esure : quand l'entrée est remise à une tension supérieure à + 2.5 V (5.5 V Max.) ou que l'entrée est maintenue ouverte, une nouvelle mesure est alors démarrée. Si la commande DISPLAY ™ ME est réglée pour un temps d'affichage infini,

réglée pour un temps d'affichage infini, alors une seule nouvelle mes ure est démarrée et stockée. Le compteur ne peut pas alors faire démarrer « ne nouUnit annunciators: kHz, MHz, ms and

**Display time:** 50 ms to 4 s and infinite **Reset:** pushing "Reset" resets the counter, releasing it starts new measurement

Gate lamp: indicates that main gate is open and counting takes place. In the Stand By position the gate lamp indicates that the line voltage or battery is connected for X-tal oscillator stabilization.

Memory: display storage holds reading between samples and can be switched off by front panel "Memory" pushbutton

Trigger indicator: tri state LED with stretched operation (channels A and B). Light on indicates too high trigger level, light off too low trigger level and blinking indicates that triggering occurs.

#### Power requirements

Line voltage:  $115/230 \text{ V} \pm 15 \%$ Line frequency: 45 to 440 Hz

Consumption: depending on type no, crystal oscillator and options. Approximately 15 VA.

Mains interference: below Class II

CENELEC/CISPR

Internal battery: PM 9673, power consumption approximately 8 W

External battery: 11.8 to 28 V, power consumption approximately 8 W. 4 mm banana connectors.

Oven oscillator: power consumption 100 mA in Stand By position

#### **Environmental conditions**

Storage temperature: -40°C to +70°C

Operating temperature: 0°C to +50°C Storage altitude: 15000 m (15.2 kN/m²) Operating altitude: 5000 m (53.3 kN/m²) Humidity: 10 to 90 % RH (26°C dew

Vibration test: IEC 68 Fc Bump test: IEC 68 Eb Handling test: IEC 68 Ec Transport test: NLN-L88

#### **Dimensions and Weight**

Width: 210 mm (8.25") Height: 89 mm (3.5") Depth: 325 mm (12.8") Weight: 2.8 kg (6.2 lb)

## 3. Options

#### Standard oscillator PM 9677

Frequency: 10 MHz

Trimming range: more than  $\pm 200~\text{Hz}$ Output voltage into 1 k $\Omega$ : more than

300 mV

Supply voltage: 12 V

Consumption: less than 100 mW at

25°C

Ausgangsimpedanz: ca. 400  $\Omega$ 

Verzögerung: Die interne Verzögerung zwischen den Signaleingängen und dem Triggermonitor-Ausgang beträgt ca. 65 ns.

Überlastungsschutz: kurzschlußfest.

## Allgemeine Daten

#### Anzeige

Ablesung: Planar, 9 Stellen; 7-Segment-Gasentladungsröhren mit automatischem Dezimalpunkt

**Einheitenangabe:** kHz, MHz, ms und ns **Anzeigedauer:** 50 ms bis 4 s und unbegrenzt

Rückstellung: Drücken des Knopfes RESET stellt den Zähler auf Null zurück. Durch Loslassen wird eine neue Zählung gestartet.

GATE Lampe: Zeigt an, daß das Haupttor offen ist und eine Zählung stattfindet. In der Stellung STAND BY zeigt die Lampe GATE an, daß Netz oder Batterie anliegen, um den Quarz-Oszillator zu stabilisieren.

Speicher: Die Anzeigespeicherung hält die Anzeige zwischen Meßvorgängen. Sie läßt sich durch die frontseitige Drucktaste MEMORY abschalten.

Triggeranzeige: Tristabile LED-Kontrollampen (Kanal A und B). Lampe EIN zeigt zu hohen und Lampe AUS zu niedrigen Triggerpegel an. Bei Triggerung Blinklicht.

#### Speisung

Netzspannung: 115/230 V ± 15 % Netzfrequenz: 45 bis 440 Hz Leistungsaufnahme: Abhängig von

Typennr., Quarzoszillator und Zubehör; ca. 15 VA

Netzstörungen: unter Class II CENELEC/CISPR

Interne Batterie: PM 9673, Leistungsverbrauch ca. 8 W

Externe Batterie: 11,8 bis 28 V, Leistungsverbrauch ca. 8 W; 4-mm-Bananenstecker

Geheizter Oszillator: Verbrauch 100 mA in Bereitschaftsbetrieb (Stand

#### Umgebungsbedingungen

Lagertemperatur: —40°C bis +70°C
Betriebstemperatur: 0°C bis +50°C
Lagerhöhe: 15000 m (15,2 kN/m²)
Betriebshöhe: 5000 m(53,3 kN/m²)
Feuchtigkeit: 10 bis 90 % rel. Luft-feuchtigkeit (Taupunkt 26°C)
Vibrationsfestigkeit: nach IEC 68 Fc
Stoßfestigkeit: nach IEC 68 Eb

Bedienungstest: nach IEC 68 Ec

Transporttest: nach NLN-88

velle mesure jusqu'à ce qu'une nouvelle impulsion de remise soit appliquée

## Caractéristiques de sortie

Sortie oscillateur base de temps D Généralités : la voi D est commutable entre l'entrée externe de la fréquence

de référence et la sortie de l'oscillateur

base de temps

Fréquence cristal : 10 MHz

Amplitude : approx. 1 V<sub>eff</sub> à circuit

ouvert

Impédance : approx. 200 ohm

Couplage: alternatif

Protection de surcharge : contre les

court-circuits

#### Sortie témoin de porte

Généralités: la sortie témoin de porte permet l'observation sur un oscilloscope d'un intervalle mesuré, (ainsi que le temps de retard sur le PM 6622) Niveau de sortie en porte principale ouverte: < 0.4 V

Niveau de sortie en porte principale

fermée : > 2.5 V

Niveau de sortie en temps de retard : approx. 1.5 V

Sortie impédance : approx. 400 ohm Retard : le retard interne entre les signaux d'entrée et la sortie témoin du déclenchement est approx. de 65 ns Protection de surcharge : contre les court-circuits

## Caractéristiques Générales

#### **Affichage**

Sortie lecture: 9 chiffres, affichage à 7 segments, (gaz), et avec point décimal automatique

Indicateurs d'unités : kHz, MHz, ms et ns

Temps d'affichage : 50 ms à 4 s et infini

Remise à zéro: la commande "RESET" enfoncée, remet le compteur à zéro, et en position relâchée une nouvelle mesure démarre

Lampe de porte : Indique que la porte principale est ouverte et que le comptage a lieu; en position d'attente, la lampe de porte indique que la tension secteur ou la batterie est appi quée en vue de la stabilisation de l'oscillateur cristal

Mémoire: l'affichage retient la lecture entre les informations et paut être grâce au bouton-poussoir "Memory" sur le panneau avant

Indicateur de déclenchement : LED trià opération prolongée (voies A et B). Lorsque la lampe est allumée en permanence, le niveau de déclenchement est trop élevé, lorsque la lampe est éteinte en permanence, le niveau de Ageing: less than  $5 \times 10^{-7}$  per month Temperature deviation 0°C to 50°C: less than  $1 \times 10^{-5}$  with reference to

+25°C

Change in measuring and supply mode:

less than 3×10<sup>-7</sup>

Line voltage ± 10 % deviation: less than  $1 \times 10^{-8}$ 

Environmental data: same as the coun-

Dimension:  $93 \times 50 \times 20$  mm

Weight: 50 g

#### **TCXO PM 9678**

Frequency: 10 MHz

Trimming range: more than ±20 Hz will cover at least 10 years of opera-

Output voltage into  $1k\Omega$ : more than 100 mV

Supply voltage: 12 V

Consumption: less than 200 mW at 25°C

Ageing: less than  $1 \times 10^{-7}$  month, the ageing will decrease substantially after

the first 6 months Temperature deviation 0°C to 50°C: less than  $1 \times 10^{-6}$  with reference to

Change in measuring and supply mode:

less than 5×10-8 Line voltage ± 10 % deviation: less than  $1 \times 10^{-9}$ 

Environmental data: same as the coun-

Dimensions:  $93 \times 50 \times 15$  mm

Weight: 25 g

#### Oven oscillator PM 9679B

Frequency: 10 MHz

Trimming range: + 20 Hz and — 30 Hz fine trimming range. A coarse trimmer is available to adjust for an ageing of more than 10 years

Output voltage into 1 k $\Omega$ : more than 150 mV

Supply voltage: + 11.5 to 28 V from unregulated power supply

Consumption at continuous operation and stand by: less than 125 mA Warm up consumption: less than 400 mA

Ageing: less than  $1 \times 10^{-7}$ /month after 72 hours of continuous operation Temperature deviation (0°C to 50°C): less than 1 x 10<sup>-7</sup> with reference to 25°C Line voltage (± 10 % deviation): less than  $1 \times 10^{-9}$ 

Change in measuring and supply mode: less than  $1 \times 10^{-8}$ 

Warm upp time: less than 15 minutes to reach  $1 \times 10^{-7}$ 

Environmental data: same as the

**Dimension:**  $100 \times 52 \times 35 \text{ mm}$ 

Weight: 100 g

#### Abmessungen und Gewicht

Breite: 210 mm Höhe: 89 mm Tiefe: 325 mm Gewicht: 2.8 kg

#### 3. Zubehör

#### Standard Oszillator PM 9677

Frequenz: 10 MHz

Abstimmbereich: mehr als ± 200 Hz Ausgangsspannung an 1 k $\Omega$ : mehr als

300 mV

Speisespannung: 12 V

Verbrauch: unter 100 mW bei 25°C Alterung: unter  $5 \times 10^{-7}$  pro Monat Temperaturabweichung 0°C bis 50°C: unter 1 × 10<sup>-5</sup> bezogen auf +25°C Wechsel von Betriebsart und Speisung

(Netz/Batterie): unter 3×10<sup>-7</sup> Netzspannung  $\pm$  10 %: unter  $1 \times 10^{-8}$ Umgebungsbedingungen: wie der Zähler

Abmessungen: 93×50×20 mm

Gewicht: 50 g

#### **TCXO PM 9678**

Frequenz: 10 MHz

Abstimmbereich: über ± 20 Hz; ausreichend für min. 10 Betriebsjahre Ausgangsspannung an 1 k $\Omega$ : über 100 mV

Speisespannung: 12 V

Verbrauch: unter 200 mW bei 25°C Alterung: unter  $1 \times 10^{-7}$  pro Monat; nach den ersten sechs Monaten nimmt

die Alterung bedeutend ab. Temperaturabweichung 0°C bis 50°C: unter 1 × 10<sup>-6</sup> bezogen auf +25°C Wechsel von Betriebsart und Speisung

(Netz/Batterie): unter 1×10<sup>-8</sup> Netzspannung  $\pm 10\%$ : unter  $1 \times 10^{-9}$ Umgebungsbedingungen: wie der

7ähler

Abmessungen:  $93 \times 50 \times 15$  mm

Gewicht: 25 g

#### Geheizter Oszillator PM 9679B

Frequenz: 10 MHz

Abstimmbereich: + 20 Hz und — 30 Hz zur Feinabstimmung. Zum Abgleich einer Alterung von mehr als 10 Jahren ist ein Grobtrimmer vorgesehen

Ausgangsspannung an 1 k $\Omega$ : über 150 mV

Speisespannung: + 11,5 bis 28 V aus nichtstabilisierter Speisung

Verbrauch bei Dauerbetrieb und Stand

by: unter 125 mA Verbrauch bei Anheizung: unter 400 mA

Alterung: unter  $1 \times 10^{-7}$  pro 24 h nach 72 Stunden Dauerbetrieb

Temperaturabweichung 0°C bis 50°C: unter 1 × 10<sup>-7</sup> bezogen auf +25°C Netzspannung  $\pm$  10 %: unter 1  $\times$  10<sup>-9</sup> Wechsel von Betriebsart und Speisung (Netz/Batterie): unter  $1 \times 10^{-8}$ 

déclenchement est trop bas, et quand la lampe clignote, le déclenchement est effectué

#### Consommation

Tension secteur :  $115/230 \text{ V} \pm 15 \%$ Fréquence secteur : 45 à 440 Hz Consommation: selon le numéro du modèle, l'oscillateur cristal et les options (approx. 15 VA)

Interférence secteur : Audessous de

class II SENELEC CISPR

Batterie interne: PM 9673, Consommation approx. 8 W

Batterie externe: 11.8 à 28 V avec une consommation d'environ 8 W. Connecteurs de 4 mm, type banane

Oscillateur à enceinte thermostatée : consommation de 100 mA en position d'attente

Caractéristiques d'environnement Température de stockage : - 40° C à

+ 70° C

Température de fonctionnement : 0° C

à + 50° C

Altitude de stockage: 15000 m

(15.2 kN/m<sup>2</sup>)

Altitude de fonctionnement : 5000 m

(53.3 kN/m<sup>2</sup>)

Humidité: 10 à 90 % RH (26° C point

requis)

Epreuve à la vibration : conforme à la norme IEC 68 Fc

Epreuve au choc : conforme à la norme

IEC 68 Eb

Epreuve manipulation: conforme à la

norme IEC 68 Ec

Epreuve transportation: conforme à la

norme NLN-L88

#### Dimensions et poids

Largeur: 210 mm (8.25") Hauter: 89 mm (3.5") **Profondeur:** 325 mm (12.8") Poids: 2.8 Kg (6.2 lb)

## 3. Options

#### Oscillateur standard PM 9677

Fréquence: 10 MHz

Gamme d'ajustement : supérieure à

± 200 Hz

Tension de sortie sous 1 k-ohn :

supérieure à 300 mV Tension d'alimentation: 12 V

Consommation: inférieure à 100 mW pour 25 C

Usure: inférieure à  $5 \times 10^{-7}$  pour un

mois

Déviation de température de 0° C à 50° C: inférieure à 1 × 10<sup>-5</sup> par rapport à + 25° C

Variation de la mesure et du node d'alimentation : inférieure à 3  $\times$  10<sup>-7</sup> Déviation ± 10 % de la tension sec-

teur: inférieure à  $1 \times 10^{-8}$ 

#### Oven oscillator PM 9690

Frequency: 10 MHz

Trimming range: +3 Hz and —7 Hz fine trimming range. A coarse trimmer is available to adjust for an ageing of more than 10 years

Output voltage into  $1k\Omega$ : more than 150 mV

Supply voltage: +11.5 to 28 V from unregulated power supply

Consumption at continuous operation and stand by: less than 125 mA Warm up consumption: less than 400 mA

Ageing: less than  $1.5\times10^{-9}/24$  h after 72 hours of continuous operation Temperature deviation 0°C to 50°C: less than  $3\times10^{-8}$  with reference to +25°C

Line voltage  $\pm$  10 % deviation: less than  $5\times10^{-10}$ 

Change in measuring and supply mode: less than  $3 \times 10^{-9}$ 

Warm up time: less than 15 minutes to reach  $1 \times 10^{-7}$ 

Environmental data: same as the counter

Dimensions: 100×52×35 mm

Weight: 100 g

#### Oven oscillator PM 9691

Frequency: 10 MHz

Trimming range: + 3 Hz and — 7 Hz fine trimming range. A coarse trimmer is available to adjust for an ageing of more than 10 years

Output voltage into 1 k $\Omega$ : more than 150 mV

**Supply voltage:** + 11.5 to 28 V from unregulated power supply

Consumption at continuous operation and stand by: less than 125 mA
Warm up consumption: less than 400 mA

**Ageing:** less than  $5 \times 10^{-10}/24$  h after 72 hours of continuous operation

Temperature deviation (0°C to 50°C): less than  $5 \times 10^{-9}$  with reference to +25°C

Line voltage ( $\pm$  10 % deviation): less than 5  $\times$  10<sup>-10</sup>

Change in measuring and supply mode: less than  $3\times 10^{-9}$ 

Warm up time: less than 15 minutes to reach  $1 \times 10^{-7}$ 

Environmental data: same as the counter

**Dimension:**  $100 \times 52 \times 35 \text{ mm}$  **Weight:** 100 g

## Rack mount adapter

PM 9669/01: 19" rack for one counter PM 9669/02: 19" rack for two counters

#### Battery unit

PM 9673: rechargeable battery for inside mounting

Anheizdauer: unter 15 Minuten, um 1  $\times$  10<sup>-7</sup> zu erreichen

Umgebungsbedingungen: wie der

Zähler

Abmessungen: 100 × 52 × 35 mm

Gewicht: 100 g

#### Geheizter Oszillator PM 9690

Frequenz: 10 MHz

Abstimmbereich: +3 Hz und —7 Hz zur Feinabstimmung. Zum Abgleich einer Alterung von mehr als 10 Jahren ist ein Grobtrimmer vorgesehen

Ausgangsspannung an 1 k $\Omega$ : über 150 mV

**Speisespannung:** +11,5 bis 28 V aus nichtstabilisierter Speisung

Verbrauch bei Dauerbetrieb und Stand by: unter 125 mA

Verbrauch bei Anheizung: unter 400 mA Alterung: unter 1,5 × 10<sup>-9</sup> pro 24 h nach 72 Stunden Dauerbetrieb

Temperaturabweichung 0°C bis 50°C: unter  $3 \times 10^{-8}$  bezogen auf + 25°C Netzspannung  $\pm 10$ %: unter  $5 \times 10^{-10}$  Wechsel von Betriebsart und Speisung

(Netz/Batterie): unter 3×10<sup>-9</sup>
Anheizdauer: unter 15 Minuten,
um 1 × 10<sup>-7</sup> zu erreichen
Umgebungsbedingungen: wie der

Zähler Abmessungen: 100×52×35 mm

Gewicht: 100 g

#### Geheizter Oszillator PM 9691

Frequenz: 10 MHz

Abstimmbereich: + 3 Hz und — 7 Hz zur Feinabstimmung. Zum Abgleich einer Alterung von mehr als 10 Jahren ist ein Grobtrimmer vorgesehen

Ausgangsspannung an 1 k $\Omega$ : über 150 mV

**Speisespannung:** + 11,5 bis 28 V aus nichtstabilisierter Speisung

Verbrauch bei Dauerbetrieb und Stand by: unter 125 mA

Verbrauch bei Anheizung: unter 400 mA Alterung: unter  $1.5 \times 10^{-10}$  pro 24 h nach 72 Stunden Dauerbetrieb

Temperaturabweichung 0°C bis 50°C: unter  $3 \times 10^{-9}$  bezogen auf + 25°C Netzspannung  $\pm 10$ %: unter  $5 \times 10^{-10}$ Wechsel von Betriebsart und Speisung

(Netz/Batterie): unter 3 × 10<sup>-9</sup>
Anheizdauer: unter 15 Minuten,
um 1 × 10<sup>-7</sup> zu erreichen

Umgebungsbedingungen: wie der Zähler

Abmessungen:  $100 \times 52 \times 35$  mm Gewicht: 100 g

#### Adapter für Einbaumontage

PM 9669/01: 19"-Gehäuse für 1 Zähler PM 9669/02: 19"-Gehäuse für 2 Zähler

#### **Batteriesatz**

PM 9673: Wiederaufladbare Batterie zur Montage im Zähler

Caractéristiques d'environnement :

comme celles du compteur **Dimension :**  $93 \times 50 \times 20 \text{ mm}$ 

Poids: 50 g

#### **TCXO PM 9678**

Fréquence : 10 MHz

Gamme d'ajustement : supérieure à ± 20 Hz, pouvant servir pendant au moins dix ans

Tension de sortie sous 1 k-ohm :

supérieure à 100 mV

Tension d'alimentation : 12 V

Consommation: inférieure à 200 mW à 25° C

**Usure:** inférieure à  $1 \times 10^{-7}$  par mois, et diminuera substantiellement après les premiers six mois

Déviation de température de 0° C à 50° C : inférieure à  $1 \times 10^{-6}$  par rapport à  $+ 25^{\circ}$  C

Variation de la mesure et du mode d'alimention : inférieure à  $5 \times 10^{-8}$  Déviation  $\pm$  10 % de la tension sec-

teur : inférieure à 1 × 10<sup>-9</sup>
Caractéristiques d'environnement :

Identiques à celles du compteur

Dimension: 93 × 50 × 15 mm

Poids: 25 g

## Oscillateur à enceinte thermostatée PM 9679B

Fréquence: 10 MHz

Gamme d'ajustement : + 20 Hz et — 30 Hz avec réglage fin. Un dispositif d'ajustement ordinaire est disponible pour suppléer à un usage de plus de dix ans

Tension de sortie sous 1 k-ohm :

supérieure à 150 mV

Tension d'alimentation : + 11.5 à 28 V non-régulée

Consommation en opération continuelle et en position d'attente : inférieure à 100 mA

Consommation au chauffage :

inférieure à 400 mA

Usure : inférieure à  $1 \times 10^{-7}/24$  h après 72 heures d'opération continuelle Déviation de température de 0° C à 50° C : inférieure à  $1 \times 10^{-7}$  par rapport à + 25° C

Déviation  $\pm$  10 % tension secteur : inférieure à  $1 \times 10^{-9}$ 

Variation de la mesure et du mode d'alimentation : inférieure à  $1 \times 10^{-8}$  Temps de chauffage : inférieure à 15 minutes pour atteindre  $1 \times 10^{-7}$  Caractéristiques d'environnement :

Identiques à celles du compteur

Dimensions: 100 × 52 × 35 mm

Poids: 100 g

## Oscillateur à enceinte thermostatée PM 9690

Fréquence : 10 MHz

Gamme d'ajustement : + 3 Hz €t - 7 Hz avec réglage fin. Un dispositif d'ajuste-

#### Carrying case

PM 9672: carrying case for the counter and measuring leads during transporta-

#### Output interface units

PM 9674: BCD output unit

PM 9675: digital to analog converter

PM 9676: bus interface unit

#### Accessories included with the instrument

Operation and service manual Line cord

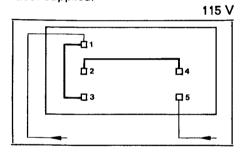
Front panel protective cover

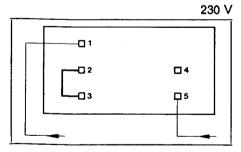
#### 4. Installation

Mains voltage conversion: the counter can be converted into two mains voltage ranges, 100 to 130 V and 200 to 260 V.

The frequency range is 45 to 440 Hz. At delivery the instrument is set to the 200 to 260 V range.

When changing to the 100 to 130 V range the connections of the mains transformer should be changed as shown in the figure below, and the "230 V" label covered with the "115 V" label supplied.





Earthing: the counter can be earthed via the protective earth terminal at the rear panel or via a three core mains cable plugged into an outlet with protective earth contact.

Use only one of these alternatives to avoid hum.

Fuses: a thermal fuse on the mains transformer and a 1.6 A fast action fuse are protecting the power supply.

Options: refer to installation instruction for each type number.

#### **Tragtasche**

PM 9672: Tragtasche für Gerät und Meßkabel

#### Ausgangs-/Interface-Einheiten

PM 9674: BCD-Ausgangseinheit PM 9675: Digital-/Analogwandler

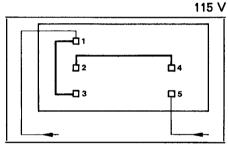
PM 9676: BUS-Interface

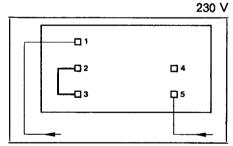
Mitgeliefertes Zubehör Handbuch Netzkabel Frontplatten-Schutzdeckel

#### 4. Installation

Netzspannungsänderung: Das Gerät läßt sich auf zwei Netzspannungsbereiche, 100-130 V und 200-260 V umschalten. Der Frequenzbereich ist 45 bis 440 Hz. Bei Lieferung ist der Zähler auf 200-260 V eingestellt.

Die Umschaltung auf 100-130 V geschieht durch Änderung der Anschlüsse des Netztransformators entspr. untenstehender Abbildung. Das Schild "230 V" ist dann mit dem Schild "115 V" zu überkleben.





Erdung: Das Gerät ist entweder über die Schutzerdungsklemme auf der Rückseite oder über den Schutzleiter des Netzkabels (nur an Schutzkontakt-Steckdose anschließen!) zu erden.

Nur eine dieser Erdungsmöglichkeiten verwenden, um Brummen zu vermeiden.

Sicherungen: Der Netzteil ist durch eine thermische Sicherung am Netztrafo und eine flinke 1,6-A-Sicherung geschützt.

Zubehör: Anleitungen zur Installation enthält das jeweilige Handbuch.

ment ordinaire est disponible pour suppléer à un usage de plus de dix ans Tension de sortie sous 1 k-ohm: supérieure à 150 mV

Tension d'alimentation: + 11.5 à 28 V

non-réaulée

Consommation en opération continuelle et en position d'attente : inférieure à 125 mA

Consommation au chauffage : inférieure à 400 mA

Usure: inférieure à  $1.5 \times 10^{-9}/24$  h après 72 heures d'opération continuelle Déviation de température de 0° C à 50° C: inférieure à 3 × 10-8 par rapport à + 25° C

Déviation ± 10 % tension secteur : inférieure à  $5 \times 10^{-10}$ 

Variation de la mesure et du mode d'alimentation : inférieure à 3 × 10<sup>-9</sup> Temps de chauffage : inférieure à 15

minutes pour atteindre 1  $\times$  10<sup>-7</sup> Caractéristiques d'environnement : Identiques à celles du compteur  $\textbf{Dimensions}: 100 \times 52 \times 35 \text{ mm}$ 

Poids: 100 g

#### Oscillateur à enceinte thermostatée PM 9691

Fréquence: 10 MHz

Gamme d'ajustement : + 3 Hz et -- 7 Hz avec réglage fin. Un dispositif d'ajustement ordinaire est disponible pour suppléer à un usage de plus de dix ans Tension de sortie sous 1 k-ohm :

supérieure à 150 mV

Tension d'alimentation: + 11.5 à 28 V non-régulée

Consommation en opération continuelle et en position d'attente : inférieure à 125 mA

Consommation au chauffage : inférieure à 400 mA

Usure: inférieure à  $1.5 \times 10^{-10}/24$  h après 72 heures d'opération continuelle Déviation de température de 0° C à 50° C: inférieure à 3 × 10-9 par rapport à + 25° C

Déviation ± 10 % tension secteur : inférieure à  $5 \times 10^{-10}$ 

Variation de la mesure et du mode d'alimentation : inférieure à 3 × 10-9 Temps de chauffage : inféreiure à 15 minutes pour atteindre 1 × 10-7 Caractéristiques d'environnement :

Identiques à celles du compteur Dimensions:  $100 \times 52 \times 35$  mm

Poids: 100 g

Adapteur pour montage Rack

PM 9669/01: rack 19" pour un comp-

PM 9669/02: rack 19" pour deux compteurs

#### **Batterie**

PM 9673: batterie rechargeable pour montage interne

#### Valise

PM 9672 : une malette pour le compteur et pour les cordons de mesure

Unités interface de sortie

PM 9674 : unité de sortie BCD PM 9675 : convertisseur digital/

analogique

PM 9676 : unité interface bus

Accessoires livrés avec l'appareil Notice d'emploi et d'entretien Cordon secteur Couverture de protection pour panneau

#### 4. Installation

Adaption secteur: le compteur peut être adapté à deux gammes de tension secteur, de 100 à 130 V et de 200 à 260 V.

La gamme de fréquence est de 45 à 440 Hz.

A la livraison, l'appareil est adapté pour la gamme de 200 à 260 V.

Pour adapter à une gamme de 100 à 130 V, modifier les connexions du transformateur secteur conformément à la figure ci-dessous et coller une étiquette de "115 V" à la place de celle de "230 V".

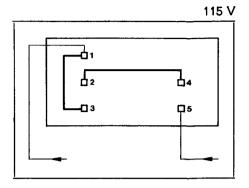
Mise à la terre : La mise à la terre peut être effectuée selon deux façons ; 1. par une prise de protection terre sur le panneau arrière.

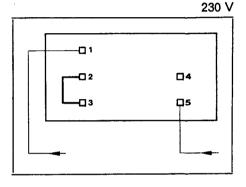
2. par le cable secteur à trois conducteurs enfichés dans une prise comportant une terre.

Remarque: il est recommandé de ne se servir que d'une de ces alternatives afin d'éviter les bruits de fond.

Fusible: un fusible thermique au transformateur secteur et un fusible de 1.6 A à action rapide protègent l'alimentation secteur.

**Options :** se référer aux instructions de l'installation pour chaque modèle.





## Controls, indicators and connectors PM 6622

## Bedienungsorgane, Indikatoren und Anschlüsse von PM 6622

## Organes de commande, connecteurs et indicateurs PM 6622



1. Display time control: Potentiometer sets display time between 0.2 s and 5 s. Infinite display time when knob is pulled. With switch set to position STAND BY the counter is turned off except of the oven oscillator.

Warning: Primary voltage of power supply is on.

- 2. kHz, MHz, ms and ns: Unit annunciators.
- 3. Gate lamp: Indicates that main-gate is opened and counting takes place, in the stand-by position the gate lamp indicates that the line voltage or battery is connected for X-tal oscillator stabilization.
- **4. Monitor socket channel A:** Output socket for set trigger level.
- 5. Trigger control channel A: Sets trigger level from —2.5 V to +2.5 V when the attenuator is in position 20 mV, and from —25 V to +25 V when the attenuator is in position 200 mV. Knob pulled sets trigger level to 0 V.
- 6. Trigger lamp channel A: Tri-state control lamp for set trigger level. Blinking lamp indicates that the set trigger level matches the level of the input signal. Lamp permanently on indicates that the set trigger level is too high, and lamp turned off indicates that set trigger level is too low.
- 7. Trigger lamp channel B: Same as trigger lamp channel A.

1. Anzeigezeit (Display time): Potentiometer-Einstellung der Anzeigezeit zwischen 0,2 und 5 s. Unbegrenzte Anzeigezeit bei gezogenem Knopf. In Stellung STAND BY wird der Zähler mit Ausnahme des geheizten Oszillators abgeschaltet.

Warnung: Primärspannung des Netzteils ist eingeschaltet.

- 2. kHz, MHz, ms und ns: Anzeige der eingestellten Meßeinheit.
- 3. Lampe GATE: Zeigt, an, daß das Haupttor offen ist und eingezählt wird. In der Stellung STAND BY zeigt diese Lampe an, daß Netz oder Batterie angeschlossen sind, um den Kristalloszillator zu stabilisieren.
- **4. Monitorbuchse Kanal A:** Ausgang für eingestellten Triggerpegel.
- 5. Einstellung des Triggerpegels Kanal A: Einstellung des Triggerpegels von —2,5 V bis +2,5 V (Abschwächer in Stellung 20 mV) oder von —25 V bis +25 V (Abschwächer in Stellung 200 mV). Durch Ziehen des Knopfes wird der Triggerpegel auf 0 V gestellt.
- 6. Triggerlampe Kanal A: Tristabile Anzeigelampe für den eingestellten Triggerpegel. Blinklicht zeigt an, daß der Triggerpegel auf Höhe des Eingangssignals liegt und eine Triggerung stattfindet. Leuchtet die Lampe dauernd, so ist der eingestellte Triggerpegel zu hoch, erlöscht sie ganz, ist er zu niedrig.
- 7. Triggerlampe Kanal B: Gleiche Funktion wie Triggerlampe Kanal A.

1. Commande du temps d'affichage: Ce potentiomètre règle le temps d'affichage entre 0.2 et 5 s. Le temps d'affichage infini est obtenu en tirant sur la commande. Avec le commutateur en position d'attente (STAND BY) le compteur est mis hors service, à l'exception de l'oscillateur à enceinte thermostatée.

Attention : La tension primaire de l'alimentation est en circuit !

- 2. KHz, MHz, ms et ns : Indicateurs d'unité.
- 3. Lampe de porte : Indique que la porte principale est ouverte et que le comptage a lieu. En position d'attente, la lampe de porte indique que la tension secteur ou batterie est appliquée en vue de la stabilisation de l'oscillateur cristal.
- **4.** Douille de contrôle de la voie A : Douille de sortie pour le réglage du niveau de déclenchement.
- 5. Commande de déclenchement pour voie A: Règle le niveau de déclenchement de —2.5 V à +2.5 V avec l'atténuateur en position 20 mV, et de —25 V à +25 V avec l'atténuateur en position 200 mV. Le niveau de déclenchement est réglé sur 0 V en tirant sur la commande.
- 6. Lampe de déclenchement pour voie A: Lampe de contrôle (tri-state) du niveau de déclenchement réglé. Lorsque la lampe clignote, le niveau de déclenchement réglé correspond au niveau du signal d'entrée. Lorsque la lampe s'allume en permanence, le niveau est trop bas.

- 8. Trigger control channel B: Same as trigger control channel A.
- 9. Monitor socket channel B: Same as monitor socket channel A.
- 10. Memory: In released position the measurement information is stored until next measurement cycle is completed. Depressed button makes display follow decade counters continuously.
- 11. Hold off control: In Single Period Time Interval this control disables retriggering of the main gate until the set hold off time is out.
- 12. Start/stop by B-Gated by B: In the upper position it sets counter to measure Count A Start-Stop by B, in the lower position counter will measure Count A Gated by B.
- 13. Frequency A: Sets counter to measure frequency at input A. 100 Hz, 10 Hz, 1 Hz and 0.1 Hz correspond to the resolution of the least significant digit.
- 14. Single: Sets counter to measure Single Period B or Single Time Interval A to B. Time resolution can be set to 0.1 ms or 0.1  $\mu$ s.
- **15. Average:** Sets counter to measure Multiple Period B or Time Interval Average A to B. 10<sup>2</sup>, 10<sup>4</sup> and 10<sup>6</sup> are number of averagings.
- 16. Ratio A/B: Sets counter to measure ratio between signals at input A and B. 10<sup>4</sup> and 10<sup>6</sup> are multipliers.
- 17. Count A: Sets counter to accumulate pulses between Start to Stop or Gated by B measurements.
- **18. Function selector:** Combined with the two slide switches it selects the different measuring modes.
- 19. Period B/Time interval A to B: Sets counter to measure Period B or Time interval A to B.
- 20. Self check: Connects 10 MHz from the internal oscillator to the input circuits of the counter.
- 21. Slope selector channel A: Sets counter to trigger on either positive or negative slope of the input signal.
- 22. Attenuator channel A: Provides 10×attenuation of the input signal.
- 23. AC/DC selector channel A: Selects AC or DC coupling of the input signal.

- 8. Einstellung des Triggerpegels Kanal B: Gleiche Funktion wie für Kanal A.
- 9. Monitorbuchse Kanal B: Gleiche Funktion wie Monitorbuchse Kanal A.
- 10. MEMORY (Speicher): In ausgelöster Stellung wird die Meßinformation bis Ende des nächsten Meßzyklus gespeichert. Bei eingedrückter Taste folgt die Anzeige kontinuierlich den Dekadenzählern.
- 11. HOLD OFF (Triggersperre): Bei Messung von Einzelperiode und EinzelZeitintervall verhindert HOLD OFF die Triggerung des Haupttors vor Ablauf der eingestellten Haltezeit.
- 12. Start/Stopp und Torsteuerung durch B: In der oberen Schalterstellung ist das Gerät auf Zählung A, Start/Stopp durch B eingestellt, in der unteren auf Zählung A und Torsteuerung durch B.
- 13. Frequenz A: Einstellung des Zählers auf Frequenzmessungen an Eingang A; 100 Hz, 10 Hz, 1 Hz und 0,1 Hz bezeichnen die Auflösung der niedrigsten Stelle.
- 14. SINGLE: Einstellung auf Messung von Einzelperiode B oder Einzel-Zeitintervall A-B. Zeitauflösung einstellbar auf 0,1 ms oder 0,1 μs.
- 15. AVG (Mittelwert): Einstellung auf Messung der Vielfachperiode B oder des Zeitintervall-Mittelwerts A-B. Anzahl der Meßperioden einstellbar auf 10<sup>2</sup>. 10<sup>4</sup> und 10<sup>6</sup>.
- 16. RATIO A/B: Zählereinstellung auf Verhältnismessung zwischen Signalen am Eingang A und Eingang B. Wählbare Multiplikatoren 10<sup>4</sup> und 10<sup>6</sup>.
- 17. COUNT A: Einstellung des Zählers zum Summieren von Impulsen bei Start/Stopp oder Torsteuerung durch B.
- 18. Funktionswähler: Zusammen mit den beiden Schiebeschaltern werden hier die verschiedenen Meßarten gewählt
- 19. PERIOD B/TIME INTERVAL A TO B: Einstellung des Zählers auf Messung von Periode B oder Zeitintervall A-B.
- 20. CHECK (Eigenkontrolle): Verbindet 10-MHz-Signale vom internen Oszillator mit den Eingangskreisen des Zählers.
- 21. Flankenwählschalter Kanal A: Einstellung der Triggerung auf negative oder positive Flanke des Eingangsignals.
- 22. Abschwächung Kanal A: 10-fache Abschwächung des Eingangssignals.

- 7. Lampe de déclenchement pour voie B : Identique à la lampe de déclenchement pour voie A.
- 8. Commande de déclenchement pour voie B : Identique à la commande de déclenchement pour voie A.
- 9. Douille de contrôle pour voie B : Identique à la douille de contrôle de la voie A.
- 10. Mémoire: En position relâchée, l'information de mesure est stockée jusqu'à ce que le cycle de mesure suivant soit accompli. En position enfoncée, l'affichage suit continuellement les compteurs à décade.
- 11. Retard de déclenchement (HOLD OFF): En mode période simple et intervalle de temps simple, cette commande empêche un déclenchement intempestif de la porte principale jusqu'à ce que le temps du retard de déclenchement soit écoulé.
- 12. Démarrage/arrêt par B/ Déclenchement par B: En position supérieure, le compteur mesure le comptage A démarrage/arrêt par B. En position inférieure, le compteur mesure le comptage A déclenchement par B.
- 13. Fréquence A : Positionne le compteur pour mesure de fréquence à l'entrée A. 100 Hz, 10 Hz, 1 Hz et 0.1 Hz correspondent à la résolution du chiffre le moins significatif.
- 14. Simple ("SINGLE"): Positionne le compteur pour mesure de période simple B ou intervalle de temps simple A à B. La résolution de temps peut être réglée sur 0.1 ms ou 0.1 µs.
- 15. Moyenne ("AVG."): Positionne le compteur pour mesure du périodemultiple B ou intervalle de temps moyen de A à B. Les moyen nes 10², 10⁴ et 10⁶, sont possibles.
- 16. Rapport A/B ("RATIO A/B"): Positionne le compteur pour ne sure du rapport entre les signaux d'entrée A et B. Les multiplicateurs 10<sup>4</sup> et 10<sup>6</sup> sont possibles.
- 17. Comptage A: Positionne le compteur pour accumuler les impulsions entre les mesures démarrage-arrêt ou déclenchement par B.
- 18. Sélecteur de fonctions : Combiné avec les deux commutateurs l'inéaires, il permet la sélection des différents modes de mesure.
- 19. Période B/ Intervalle de temps A à B ("PERIOD B/TIME INT. ATO B"): Positionne le compteur pour nesure de période B, ou intervalle de temps A à B.
- 20. Auto Contrôle : Connete le 10 MHz de l'oscillateur interne aux circuits d'entrée du compteur.

- 24. Separate/Common via B: Connects channel A and B internally in position COM VIA B. In position SEP the input channels are separated.
- 25. AC/DC selector channel B: Same as AC/DC selector channel A.
- 26. Attenuator channel B: Same as attenuator channel A.
- 27. Slope selector channel B: Same as slope selector channel A.
- 28. Input A: Input socket for frequency, ratio and time interval measurement.
- 29. Input B: Input socket for period, ratio and time interval measurement.
- 30. Reset: Resets counter and display to zero.

- 23. AC/DC-Wählschalter Kanal A: Wahl von AC- oder DC-Kopplung des Eingangssignals.
- 24. SEP/COM über B: In Stellung COM VIA B werden Kanal A und Kanal B intern verbunden. In Stellung SEP sind die beiden Eingangskanäle getrennt.
- 25. AC/DC-Wählschalter Kanal B: Siehe AC/DC-Wählschalter Kanal A.
- 26. Abschwächung Kanal B: Siehe Abschwächung Kanal A.
- 27. Flankenwählschalter Kanal B: Siehe Flankenwählschalter Kanal A.
- **28. Eingang A:** Eingangsbuchse für Frequenz-, Verhältnis- und Zeitintervallmessungen.
- 29. Eingang B: Eingangsbuchse für Perioden-, Verhältnis- und Zeitinter-vallmessungen.
- 30. RESET: Rückstellung von Zähler und Anzeige auf Null.

- 21. Sélecteur de pente pour voie A : Positionne le compteur pour déclencher sur pente positive ou négative du signal d'entrée.
- 22. Atténuateur pour voie A : Fournit une atténuation  $10 \times du$  signal d'entrée.
- 23. Sélecteur AC/DC pour voie A : Sélectionne le couplage capacitif ou continu du signal d'entrée.
- 24. Séparé/Commun par B ("SEP/COM"): Connecte les voies A et B à l'intérieur en position COM VIA B. En position SEP, les voies d'entrée sont séparées.
- 25. Sélecteur AC/DC pour voie B : Identique au sélecteur AC/DC pour voie A.
- 26. Atténuateur voie B : Identique à l'atténuateur voie A.
- 27. Sélecteur de pente pour voie B : Identique au sélecteur de pente pour voie A.
- 28. Entrée A : Douille d'entrée pour mesure de fréquence, de rapport et d'intervalle de temps.
- 29. Entrée B: Douille d'entrée pour mesure de période, de rapport et d'intervalle de temps.
- 30. Remise à zéro : Remet le compteur et l'affichage à zéro.

Controls, indicators and connectors PM 6624 and PM 6625

Bedienungsorgane, Indikatoren und Anschlüsse von PM 6624 und PM 6625 Organes de commande, connecteurs et indicateurs PM 6624 et PM 6625



1. Display time control: Potentiometer sets display time between 0.2 and 5 s. Infinite display time when knob is pulled. With switch set to position STAND BY the counter is turned off except of the oven oscillator.

Warning: Primary voltage of power supply is on.

- 2. kHz, MHz, ms and ns: Unit annunciators
- 3. Gate lamp: Indicates that main-gate is opened and counting takes place, in the stand-by position the gate lamp indicates that the line voltage or battery is connected for X-tal oscillator stabilization.
- 4. Monitor socket channel A: Output socket for set trigger level.
- 5. Trigger control channel A: Sets trigger level from —2.5 V to +2.5 V when the attenuator is in position 20 mV, and from —25 V to +25 V when the attenuator is in position 200 mV. Knob pulled sets trigger level to 0 V.
- 6. Trigger lamp channel A: Tri-state control lamp for set trigger level. Blinking lamp indicates that the set trigger level matches the level of the input signal. Lamp permanently on indicates that the set trigger level is too high, and lamp turned off indicates that set trigger level is too low.
- 7. Trigger lamp channel B: Same as trigger lamp channel A.

1. Anzeigezeit (Display time): Potentiometer-Einstellung der Anzeigezeit zwischen 0,2 und 5 s. Unbegrenzte Anzeigezeit bei gezogenem Knopf. In Stellung STAND BY wird der Zähler mit Ausnahme des geheizten Oszillators abgeschaltet.

Warnung: Primärspannung des Netzteils ist eingeschaltet.

- 2. kHz, MHz, ms und ns: Anzeige der eingestellten Meßeinheit.
- 3. Lampe GATE: Zeigt an, daß das Haupttor offen ist und eingezählt wird. In der Stellung STAND BY zeigt diese Lampe an, daß Netz oder Batterie angeschlossen sind, um den Kristalloszillator zu stabilisieren.
- 4. Monitorbuchse Kanal A: Ausgang für eingestellten Triggerpegel.
- 5. Einstellung des Triggerpegels Kanal A: Einstellung des Triggerpegels von —2,5 V bis +2,5 V (Abschwächer in Stellung 20 mV) oder von —25 V bis +25 V (Abschwächer in Stellung 200 mV). Durch Ziehen des Knopfes wird der Triggerpegel auf 0 V gestellt.
- 6. Triggerlampe Kanal A: Tristabile Anzeigelampe für den eingestellten Triggerpegel. Blinklicht zeigt an, daß der Triggerpegel auf Höhe des Eingangssignals liegt und eine Triggerung stattfindet. Leuchtet die Lampe dauernd, so ist der eingestellte Triggerpegel zu hoch, erlöscht sie ganz, ist er zu niedrig.

1. Commande du temps d'affichage: Ce potentiomètre règle le temps d'affichage entre 0.2 s et 5 s. On obtient le temps d'affichage infini en tirant sur la commande. En position d'attente (STAND BY) le compteur est mis hors service à — l'exception de l'oscillateur à enceinte thermostatée.

Attention : La tension primare de l'alimentation est en circuit !

- 2. KHz, MHz, ms et ns : Indicateurs d'unité.
- 3. Lampe de porte: Indique que la porte principale est ouverte et que le comptage a lieu; en position d'attente, la lampe de porte indique que la tension secteur ou batterie est appliquée en vue de la stabilisation de l'oscillateur cristal.
- 4. Douille de contrôle de la voie A : Douille de sortie pour le réglage du niveau de déclenchement.
- 5. Commande de déclenchement pour voie A: Règle le niveau de déclenchement de 2.5 V à + 2.5 V avec atténuateur en position 20 mV et de 25 V + 25 V avec atténuateur en position 200 mV. Le niveau de déclenchement est réglé sur 0 V en tirant sur ce bouton.
- 6. Lampe de déclenchement pour voie A: Lampe de contrôle (tri-state) du niveau de déclenchement réglé. Lorsque la lampe clignote, le niveau de déclenchement réglé correspond au niveau du signal d'entrée. Lorsque la lampe est allumée en permanence, le niveau de déclenchement est trop

- 8. Trigger control channel B: Same as trigger control channel A.
- 9. Monitor socket channel B: Same as monitor socket channel A.
- 10. Memory: In released position the measurement information is stored until next measurement cycle is completed. Depressed button makes display follow decade counters continuously.
- 11. Input C: Input socket for frequency and ratio measurement.
- 12. Start-Stop by B/Gated by B and Input A/Input C: In the upper position it sets counter to measure Count A Start-Stop by B, Frequency A, or Ratio A/B and in the lower position it sets counter to measure Count A Gated by B, Frequency C or Ratio C/B depending on how the Function Selector is set.
- 13. Frequency A and C: Sets counter to measure frequency at inputs A and C. 100 Hz, 10 Hz, 1 Hz and 0.1 Hz correspond to the resolution of the least significant digit.
- 14. Single: Sets counter to measure Single Period B or Single Time Interval A to B. Time resolution can be set to 0.1 ms or 0.1  $\mu$ s.
- **15. Average:** Sets counter to measure Multiple Period B or Time Interval average A to B. 10<sup>2</sup>, 10<sup>4</sup> and 10<sup>6</sup> are number of averagings.
- 16. Ratio A/B or C/B: Combined with Input A/Input C switch it selects Ratio A/B or Ratio C/B measurement. 10<sup>4</sup> and 10<sup>6</sup> are multipliers.
- 17. Count A: Sets counter to accumulate pulses between Start to Stop or Gated by B measurements.
- **18. Function selector:** Combined with the two slide switches it selects the different measuring modes.
- 19. Period B/Time interval A to B: Sets counter to measure Period B or Time interval A to B.
- 20. Self check: Connects 10 MHz from the internal oscillator to the input circuits of the counter.
- 21. Slope selector channel A: Sets counter to trigger on either positive or negative slope of the input signal.
- 22. Attenuator channel A: Provides 10×attenuation of the input signal.

- 7. Triggerlampe Kanal B: Gleiche Funktion wie Triggerlampe Kanal A.
- 8. Einstellung des Triggerpegels Kanal B: Gleiche Funktion wie für Kanal A.
- 9. Monitorbuchse Kanal B: Gleiche Funktion wie Monitorbuchse Kanal A.
- 10. MEMORY (Speicher): Bei gelöster Taste wird die Meßinformation bis Ende des nächsten Meßzyklus gespeichert. Bei eingedrückter Taste folgt die Anzeige kontinuierlich den Dekadenzählern.
- **11. Eingang C:** Eingangsbuchse für Frequenz- und Verhältnismessung.
- 12. Stort/Stopp und Torsteuerung durch B sowie INPUT A/INPUT C: In der oberen Schalterstellung ist das Gerät auf Zählung A (Start/Stopp durch B), Frequenz A oder Verhältnis A/B eingestellt. In der unteren Schalterstellung hingegen auf Zählung A (Torsteuerung durch B), Frequenz C oder Verhältnis C/B je nach Einstellung des Funktionswählers.
- 13. Frequenz A und C: Einstellung auf Frequenzmessungen an den Eingängen A und C; 100 Hz, 10 Hz, 1 Hz und 0,1 Hz bezeichnen die Auflösung der niedrigsten Stelle.
- 14. SINGLE: Einstellung auf Messung der Einzelperiode B oder des EinzelZeitintervalls A-B. Zeitauflösung einstellbar auf 0,1 ms oder 0,1  $\mu$ s.
- 15. AVG (Mittelwert): Einstellung auf Messung der Vielfachperiode B oder des Zeitintervall-Mittelwerts A-B. Anzahl der Meßperioden einstellbar auf 10<sup>2</sup>, 10<sup>4</sup> und 10<sup>6</sup>.
- **16. RATIO A/B or C/B:** Zusammen mit dem Schalter INPUT A/INPUT C wird hier zwischen Verhältnismessung A/B oder C/B gewählt. 10<sup>4</sup> und 10<sup>6</sup> sind wählbare Multiplikatoren.
- 17. COUNT A: Einstellung des Zählers zum Summieren von Impulsen bei Start/Stopp oder Torsteuerung durch B.
- 18. Funktionswähler: Zusammen mit den beiden Schiebeschaltern werden hier die verschiedenen Meßarten gewählt.
- 19. PERIOD B/TIME INTERVAL A TO B: Einstellung des Zählers auf Messung von Periode B oder Zeitintervall A-B.
- 20. CHECK (Eigenkontrolle): Verbindet 10-MHz-Signale vom internen Oszillator mit den Eingangskreisen des Zählers.

- élevé, par contre, si la lampe s'éteint ce niveau est trop bas.
- 7. Lampe de déclenchement pour voie B : Identique à la lampe de déclenchement pour voie A.
- 8. Commande de déclenchement pour voie B : Identique à la commande de déclenchement pour voie A.
- 9. Douille de contrôle de la voie B : Identique à la douille de contrôle de la voie A.
- 10. Mémoire: En position relâchée, l'information de mesure est stockée jusqu'à ce que le cycle de mesure suivant soit accompli. En position enfoncée, l'affichage suit continuellement les compteurs à decade.
- 11. Entrée C : Douille d'entrée pour mesure de fréquence et de rapport.
- 12. Démarrage/Arrêt par B/Déclenchement par B et Entrée A/Entrée C: En position supérieure, le compteur mesure le comptage A démarrage/ arrêt par B, la fréquence ou le rapport A/B. En position inférieure, le compteur mesure le comptage A déclenchement par B, la fréquence C ou le rapport C/B selon la position du sélecteur de fonctions.
- 13. Fréquence A et C: Positionne le compteur pour mesurer la fréquence aux entrées A et C. 100 Hz, 10 Hz, 1 Hz et 0.1 Hz correspondent à la résolution du chiffre le moins significatif.
- 14. Simple (SINGLE): Positionne le compteur pour mesurer la période simple B, ou l'intervalle de temps simple de A à B. La résolution de temps peut être réglée sur 0.1 ms ou 0.1  $\mu$ s.
- 15. Moyenne (AVG.): Positionne le compteur pour mesurer la pério de multiple B, ou la moyenne de l'intervalle de temps A à B, 10<sup>2</sup>, 10<sup>4</sup> et 10<sup>6</sup>, sont le nombre de moyennes possibles.
- 16. Rapport A/B ou C/B: Combinée avec entrée A/entrée C, cette position permet de mesurer le rapport A/B ou le rapport C/B. Les multiplicateurs 10<sup>4</sup> et 10<sup>6</sup> sont possibles.
- 17. Comptage A: Positionne le compteur pour accumuler les impulsions entre les mesures démarrage arrêt ou déclenchement par B.
- 18. Sélecteur de fonctions : Combiné avec les deux commutateurs à coulisse, il sélectionne les différents modes de mesure.
- 19. Période B/Intervalle de temps A à B ("PERIOD B/ TIME INT. A TO B"): Positionne le compteur pour mesurer la période B ou l'intervalle de temps A à B.

- 23. AC/DC selector channel A: Selects AC or DC coupling of the input signal.
- 24. Separate/Common via B: Connects channel A and B internally in position COM VIA B. In position SEP the input channels are separated.
- **25.** AC/DC selector channel B: Same as AC/DC selector channel A.
- 26. Attenuator channel B: Same as attenuator channel A.
- 27. Slope selector channel B: Same as slope selector channel A.
- 28. Input A: Input socket for frequency, ratio and time interval measurement.
- 29. Input B: Input socket for period, ratio and time interval measurement.
- 30. Reset: Resets counter and display to zero.

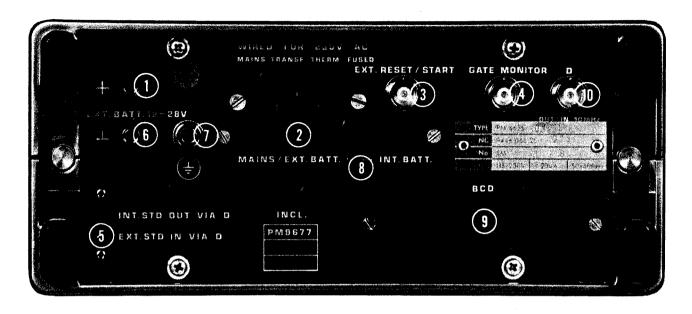
- 21. Flankenwählschalter Kanal A: Einstellung der Triggerung auf negative oder positive Flanke des Eingangsignals.
- 22. Abschwächung Kanal A: 10-fache Abschwächung des Eingangssignals.
- 23. AC/DC-Wählschalter Kanal A: Wahl von AC- oder DC-Kopplung des Eingangsignals.
- 24. SEP/COM über B: In Stellung COM VIA B werden Kanal A und Kanal B intern verbunden. In Stellung SEP sind die beiden Eingangskanäle getrennt.
- 25. AC/DC-Wählschalter Kanal B: Siehe AC/DC-Wählschalter Kanal A.
- **26. Abschwächung Kanal B:** Siehe Abschwächung Kanal A.
- 27. Flankenwählschalter Kanal B: Siehe Flankenwählschalter Kanal A.
- **28. Eingang A:** Eingangsbuchse für Frequenz-, Verhältnis- und Zeitintervallmessungen.
- **29. Eingang B:** Eingangsbuchse für Perioden-, Verhältnis- und Zeitinter-vallmessungen.
- 30. RESET: Rückstellung von Zähler und Anzeige auf Null.

- 20. Auto Contrôle : Connecte le 10 MHz de l'oscillateur interne aux circuits d'entrée du compteur.
- 21. Sélecteur de pente pour voie A : Positionne le compteur pour déclencher sur la pente positive ou négative du signal d'entrée.
- 22. Atténuateur voie A : Fournit une atténuation 10 x du signal d'entrée.
- 23. Sélecteur AC/DC pour voie A : Sélectionne le couplage capacitif ou continu du signal d'entrée.
- 24. Séparé/Commun par B ("SEP/COM"): Connecte les voies A et B à l'intérieur en position COM VIA B. En position SEP, les voies d'entrée sont séparées.
- 25. Sélecteur AC/DC pour voie B : Identique au sélecteur AC/DC pour voie A.
- 26. Atténuateur pour voie B : Identique à l'atténuateur pour voie A.
- 27. Sélecteur de pente pour voie B: Identique au sélecteur de pente pour voie A.
- 28. Entrée A : Douille d'entrée pour mesure de fréquence, de rapport et d'intervalle de temps.
- 29. Entrée B : Douille d'entrée pour mesure de période, de rapport et d'intervalle de temps.
- 30. Remise à zéro : Remet le compteur et l'affichage à zéro.

#### Controls and connectors

## Bedienungsorgane und Anschüsse

# Organes de commande et connecteurs



- 1. External battery socket: Plus pole input socket för external battery.
- 2. Mains input: Input socket for the
- 3. External reset input: Input socket for reset/start signal.
- 4. Monitor socket gate signal: Output socket for gate and hold off (PM 6622) signals.
- 5. Internal/External Standard switch: Sets operating mode of input D to either internal 10 MHz out or external 10 MHz in.
- **6. External battery socket:** Minus pole input socket for external battery.
- 7. Chassis ground: Protective earth terminal
- 8. Mains/Battery switch: Sets power supply to be fed from external or internal power source.
- 9. BCD and D/A connector: Output connector for the BCD and D/A units.
- 10. Internal/External Standard socket:10 MHz out or external 10 MHz in.

- 1. Buchse für externe Batterie: Pluspol zum Anschluß der externen Batterie.
- 2. Netzeingang: Anschluß des Netzkabels.
- 3. Buchse für externe Rückstellung: Eingang für externe Rückstell-/Startsignale.
- **4. Monitorbuchse für Torsignale:** Ausgang für Tor- und HOLD OFF-Signale (letztere nur PM 6622).
- 5. Schalter INT. STD./EXT. STD.: Einstellung der Betriebsart von Eingang D auf interne 10 MHz oder externe 10 MHz.
- 6. Buchse für externe Batterie: Minuspol zum Anschluß der externen Batterie.
- 7. Gehäuseerdung: Schutzerdungsklemme.
- 8. Umschalter Netz/Batterie: Einstellung auf Netz- oder Batteriespeisung des Geräts.
- 9. Buchse für BCD und D/A: Ausgang für BCD-Steckkarte oder D/A-Wandler.
- 10. Buchse für internen/externen Standard: 10-MHz-Ausgang oder externer 10-MHz-Eingang.

- 1. Douille pour batterie externe: Douille d'entrée à pôle positif pour batterie externe.
- 2. Entrée secteur : Douille d'entrée secteur.
- 3. Entrée de remise à zéro externe : Douille d'entrée pour remise à zéro/ signal de démarrage.
- 4. Douille de contrôle pour signal de porte : Douille de sortie pour signaux de porte et de retard de déclenchement (PM 6622).
- 5. Commutateur standard interne/externe: Commute soit l'oscillateur interne, soit l'oscillateur externe, avec entrée ou sortie de la fréquence 10 MHz, sur la douille D.
- 6. Douille pour batterie externe:
  Douille d'entrée à pôle négatif, pour batterie externe.
- 7. Prise de terre : Protection terre.
- 8. Commutateur secteur/batterie: Règle l'alimentation pour source interne ou externe.
- 9. Connecteur BCD et D/A: Connecteur de sortie pour unités BCD et D/A.
- 10. Douille standard interne/₂xterne : Sortie du signal 10 MHz, ou €rstrée du signal 10 MHz externe.

#### **Operation**

Mains: Before the counter is connected to the mains check that the mains transformer is wired for the local mains voltage as described in chapter Installation.

- Set switch MAINS EXT. BATT/INT. BATT on the rear panel to position MAINS EXT. BATT.
- Connect the mains cable to input socket for the mains at the rear panel.
  Set DISPLAY TIME control at the front panel to position ON.
- Check that display turns on indicating that power is on.

External battery: Set switch MAINS EXT. BATT/INT. BATT at the rear panel to position MAINS EXT. BATT.

- Connect the cables from the external battery to sockets EXT. BATT. 12—28 V at the rear panel.
- Set DISPLAY TIME at the front panel control to position ON.
- Check that display turns on indicating that power is on.

**Internal battery PM 9673:** Set switch MAINS EXT. BATT/INT. BATT. at the rear panel to position INT. BATT.

- Set DISPLAY TIME control at the front panel to position ON.
- Check that display turns on indicating that power is on. Blinking display indicates low voltages. Refer to manual PM 9673 for charging instructions.

Warm up time: The warm up time from the moment of mains connection is less than 7 minutes to an oscillator error of less than 10<sup>-7</sup> for instruments equipped with the oven enclosed oscillator PM 9690. Instruments equipped with the oscillators PM 9677 or PM 9678 (TCXO) are ready for use at the moment of mains connection.

Normally the instrument is switched on from the STAND BY position. If so, no warm up time it needed, irrespective of which oscillator is employed.

**External frequency standards:** House standards or other frequency standards can be used instead of the internal 10 MHz oscillator.

If a time resolution of 100 ns is required, 10 MHz must be used. When using 1 MHz instead of 10 MHz the decimal point must be shifted one step to the left to interpret the display correctly. To set the counter to external standard the switch INT. STD OUT VIA D/EXT. STD IN VIA D at the rear panel must be set to position EXT. STD IN VIA D.

#### **Betrieb**

Netzanschluß: Vor Anschluß des Zählers an das Netz überzeuge man sich, daß der Netztrafo der örtlichen Spannung entsprechend verdrahtet ist (vgl. Abschnitt "Installation").

- Schalter MAINS EXT. BATT/INT.
   BATT auf der Rückseite des Geräts auf MAINS EXT. BATT stellen.
- Netzkabel auf der Rückseite einstecken.
- Einsteller DISPLAY TIME auf ON stellen.
- Kontrollieren, ob die Anzeige aufleuchtet und das Gerät somit eingeschaltet ist.

Externe Batterie: Schalter MAINS EXT. BATT/INT. BATT auf der Rückseite des Geräts auf MAINS EXT. BATT stellen. — Anschlußkabel der externen Batterie in die Buchsen EXT. BATT 12—28 V auf der Rückseite stecken.

- Einsteller DISPLAY TIME auf ON stellen.
- Kontrollieren, ob die Anzeige aufleuchtet und das Gerät somit eingeschaltet ist.

Interne Batterie PM 9673: Schalter MAINS EXT. BATT/INT. BATT auf der Geräterückseite auf INT. BATT stellen.
— Einsteller DISPLAY TIME auf ON

- Einsteller DISPLAY TIME auf ON stellen.
- Kontrollieren, ob die Anzeige aufleuchtet und das Gerät somit eingeschaltet ist. Blinkende Anzeige bedeutet zu niedrige Spannung. Anweisungen zur Aufladung der Batterie enthält das Handbuch PM 9673.

**Aufwärmzeit:** Die Aufwärmzeit vom Netzanschluß bis zur Erreichung einer Oszillator-Fehlergrenze von unter 10<sup>-7</sup> beträgt bei Geräten mit dem geheizten Oszillator PM 9690 weniger als 7 Minuten. Zähler mit den Oszillatoren PM 9677 oder PM 9678 (TCXO) sind sofort nach Netzanschluß betriebsbereit.

Gewöhnlich wird das Instrument aus der Stellung STAND BY eingeschaltet. In diesem Fall ist keine Aufwärmzeit erforderlich, gleichgültig welcher Oszillator verwendet wird.

Externe Frequenzstandards: Anstelle des 10-MHz-Oszillators können auch andere Frequenzstandards verwendet werden.

Um eine Zeitauflösung von 100 ns zu erreichen, sind jedoch 10 MHz unbedingt erforderlich. Bei Verwendung von

#### Mise en service

Secteur: Avant de brancher le compteur au secteur, vérifier si le — transformateur secteur est connecté pour la tension secteur locale, comme décrit au chapître INSTALLATION.

- Mettre le commutateur MAINS EXT. BATT/INT. BATT du panneau arrière, en position MAINS EXT. BATT.
- Connectez le câble secteur à la douille d'entrée secteur à l'arrière.
- Réglez la commande DISPLAY
   TIME (panneau avant) sur position ON.
   Vérifier si l'affichage s'allume, indiquant ainsi que l'appareil est branché.

**Batterie externe**: Mettre le commutateur MAINS EXT. BATT/INT. BAIT (panneau arrière) en position MAINS EXT. BATT.

- Connecter les câbles de la batterie externe aux douilles EXT. BATT. 12— 28 V (panneau arrière).
- Mettre la commande DISPLAY TIME (panneau avant) en position ON.
- Vérifier si l'affichage s'allume, indiquant ainsi que l'appareil est branché.

Batterie interne PM 9673: Mettre le commutateur MAINS EXT. BATT/INT. BATT (panneau arrière) en position INT. BATT.

- Mettre la commande DISPLAY TIME (panneau avant) en position ON.
- Vérifier que l'affichage s'allume, indiquant ainsi que l'appareil est branché. Si l'affichage clignote, cela signifie que les batteries sont presque déchargées. Voir la notice PM 9673 pour instructions de charge.

Temps de chauffage: Le temps de chauffage à partir du branchement au secteur est inférieur à 7 minutes avec erreur de l'oscillateur inférieure à 10<sup>-7</sup>, lorsque les compteurs sont équipés de l'oscillateur à enceinte thermostatée PM 9690. Les appareils équipés des oscillateurs PM 9677 ou PM 9678 (TCXO) sont prêts à l'usage dès le branchement au secteur.

Normalement, l'appareil est erclenché en position d'attente (STAND BY). Dans ce cas, le temps de chauffage n'est pas nécessaire, quelque soit l'oscillateur utilisé.

Etalons de fréquence externe : Des étalons de fréquence externe peuvent être utilisés à la place de l'os; i llateur interne 10 MHz.

Pour une résolution de temps de 100 ns, l'oscillateur à 10 MHz doit être sutilisé. En cas d'application de 1 NHz au lieu de 10 MHz, le point décinal doit

A, B and C inputs: The A and B amplifiers are identical in specification and provided with identical input controls. The A input is normally used for frequency measurement and the B input for time measurement.

The C input is a prescaler input with automatic PIN-diode attenuator and mainly used for high frequency meaurement.

ac and dc coupling: The ac/dc pushbutton controls the coupling of the input signal to the attenuator and the amplifier by switching a capacitor in series in the ac mode and by direct coupling in the dc mode.

ac coupling is normally used to block the dc component in signals which are superimposed on a ac voltage. The capacitor in series will, however, cause a falling sensitivity for low frequencies. In waveforms where pulse width and repetition time vary the dc level will also vary. Change in the dc level will cause changes in the preset triggering level and make accurate time measurements impossible if ac coupled, in such cases the input should be dc coupled. Normally frequency measurements are performed with an ac coupled input and time interval measurements with a dc coupled input.

Attenuator and Trigger Level: The TRIGGER LEVEL control allows continuous setting of the trigger level at any point of the input signal. For high amplitude signals the attenuator is used to expand the setting range.

However, input attenuation will decrease the sensitivity and cause bigger trigger errors.

For frequency measurements on sine wave and other symmetrical signals no level off-set is required. Pulled position of the TRIGGER LEVEL control sets the trigger level to 0 V for highest sensitivity.

However, for frequency measurement on narrow pulses a limited off-set voltage may be needed to obtain reliable triggering.

Time measurement requires continuously variable setting of the trigger level.

Monitor sockets for channel A and B provide the ability to measure the set trigger level.

If the attenuator is set to 200 mV the trigger level range is increased 10 times from  $\pm 2.5$  V to  $\pm 25$  V.

The name trigger level can be misleading, since triggering does not occur on the set trigger level but at the trigger point.

1 MHz anstelle von 10 MHz ist der Dezimalpunkt um eine Stelle nach links zu verschieben, um die Anzeige korrekt abzulesen. Um den Zähler auf ein externes Standardsignal einzustellen, ist der Schalter INT. STD. OUT VIA D/EXT. STD. IN VIA D in die Stellung EXT. STD. IN VIA D zu bringen.

Eingänge A, B und C: Die Verstärker A und B sind den Kenngrössen und Eingangsreglern nach identisch. Der Eingang A wird gewöhnlich für Frequenzmessungen verwendet, der Eingang B für Zeitmessungen.

Der Eingang C ist ein Vorteilereingang mit automatischem PIN-Dioden-Abschwächer und wird vorzugsweise zum Messen hoher Frequenzen verwendet.

AC- und DC-Kopplung: Die Drucktaste AC/DC regelt die Kopplung des Eingangsignals mit dem Abschwächer und dem Verstärker durch Serienschaltung eines Kondensators im AC-Betrieb bzw. Direktkopplung im DC-Betrieb.

Die AC-Kopplung wird gewöhnlich verwendet, um die Gleichspannungskomponente von Signalen, die einer Wechselspannung überlagert sind, zu unterdrücken. Der seriengeschaltete Kondensator verursacht jedoch eine Abnahme der Empfindlichkeit bei niedrigen Frequenzen. Bei Signalformen mit wechselnder Impulsbreite und Wiederholzeit wechselt auch der Gleichspannungspegel. Veränderungen des Gleichspannungspegels führen wiederum zu Schwankungen des voreingestellten Triggerpegels und machen, falls ACgekoppelt, genaue Zeitmessungen unmöglich. In solchen Fällen sollte der Eingang DC-gekoppelt sein. Normalerweise werden Frequenzmessung mit AC-gekoppeltem Eingang und Zeitintervallmessungen mit DC-gekoppeltem Eingang durchgeführt.

Abschwächer und Triggerpegel: Mit dem Potentiometer TRIGGER LEVEL läßt sich der Triggerpegel stufenlos auf jeden beliebigen Punkt des Eingangsignals einstellen. Bei hohen Amplituden wird ein Abschwächer verwendet, um den Einstellbereich zu erweitern.

Eingangsdämpfung vermindert jedoch die Empfindlichkeit und verursacht größere Triggerfehler.

Für Frequenzmessungen an sinusförmigen und anderen symmetrischen Signalen ist kein Pegel-Offset erforderlich. Durch Ziehen des Knopfes TRIG-GER LEVEL wird der Triggerpegel auf

être décalé d'une unité vers la gauche, afin d'interpréter — correctement l'affichage. Pour régler le compteur sur étalon externe, régler le commutateur INT. STD OUT VIA D/EXT. STD IN VIA D en position — EXT. STD IN VIA D.

Entrées A, B et C: Les amplificateurs A et B sont identiques en spécification et pourvus des mêmes commandes d'entrée.

L'entrée A est normalement utilisée pour la mesure de fréquence, et l'entrée B pour la mesure de temps.

L'entrée C est une entrée de pré-étaionnage avec atténuateur automatique à diodes PIN et utilisée principalement pour la mesure de haute fréquence.

Couplages capacitif et continu: Les boutons-poussoires AC/DC contrôlent le couplage du signal d'entrée vers l'atténuateur et l'amplificateur en commutant un condensateur en série en mode AC (capacitif) et par couplage direct en mode DC (continu). Le couplage capacitif est normalement utilisé pour bloquer les — composantes continues dans les signaux superposés à une tension alternatif quoique le condensateur en série fasse décroître la sensibilité à basse fréquence.

Les formes d'onde à largeur d'impulsion et de temps de répétition variables présentent également un niveau continu variable.

Lorsque le niveau continu varie, le niveau de déclenchment préréglé varie également et rend les mesures de temps imprécises en couplage — capacitif. Dans de tels cas, l'entrée doit être couplée en continu. Normalement les mesures de fréquence sont effectuées avec une entrée en couplage capacitif, et les mesures dintervalle de temps avec une entrée en couplage continu.

Atténuateur et niveau de déclenchement: La commande TRIGGER LEVEL permet le réglage continu du liveau de déclenchement en tout point du signal d'entrée. Pour les signaux à haute amplitude, l'atténuateur sert à étendre la gamme de réglage.

Cependant, l'atténuation d'est rée fait décroîte la sensibilité et enta îne des erreurs de déclenchements plus importantes.

Pour des mesures de fréquence sur onde sinusoïdale et d'autres signaux symétriques, aucun offset de niveau n'est requis.

Le niveau de déclenchement est réglé

Separate and Common via B mode: In the SEP position the A and B inputs operate independently of each other in any operations irrespective of input sources. In the COM position the A input is disconnected from its attenuator and amplifier, and a signal connected to input B is coupled to both A and B attenuators and amplifiers.

All input specifications of input B will remain the same but the input impedance will be 500 k $\Omega$  shunted by 50 pF.

Positive and negative slope triggering: This push-button determines on which slope of the input signal the triggering will occur.

In released position the triggering will occur at the positive slope of the input signal and in depressed position it will occur on the negative slope.

Where on the slope the triggering will occur is determined by the TRIGGER LEVEL control.

A simple way to measure the pulse width of a positive pulse is achieved by setting input A to positive slope and input B to negative slope, connect the pulse to input B, set FUNCTION SELECTOR to any of the two SINGLE positions, slide switch PERIOD B/TIME INT. A TO B to position TIME INT. A TO B and SEP/COM to COM.

Hold off PM 6622: This control provides a delayed triggering of the instrument in single period and time interval measurement, this feature is used to avoid false triggering on noisy signals.

0 V für höchste Empfindlichkeit eingestellt.

Für Frequenzmessungen an schmalen Impulsen kann jedoch eine begrenzte Offset-Spannung erforderlich sein, um eine verläßliche Triggerung zu erreichen.

Für Zeitmessungen ist eine stufenlos variable Einstellung des Triggerpegels erforderlich.

Mit Hilfe der Monitorbuchsen für Kanal A und B läßt sich der eingestellte Triggerpegel messen.

Durch Einstellung des Abschwächers auf 200 mV wird der Triggerpegelbereich zehnfach erweitert, von  $\pm$  2,5 auf  $\pm$  25 V.

Die Bezeichnung Triggerpegel mag hier irreführend sein, da die Triggerung nicht am eingestellten Triggerpegel erfolgt, sondern am Triggerpunkt.

Schaltart SEP (getrennt) und COM (gemeinsam) über B: In Stellung SEP arbeiten die Eingänge A und B in jeder Betriebsart unabhängig voneinander, ungeachtet der Signalquellen. In Stellung COM ist der Eingang A von seinem Abschwächer und Verstärker getrennt, und das Signal am Eingang B wird an die Abschwächer und Verstärker beider Kanäle (A und B) gekoppelt. Alle Kenngrössen von Eingang B bleiben unverändert, doch beträgt die Eingangsimpedanz 500 k $\Omega$ , geshunted mit 50 pF.

Triggerung auf positiver und negativer Flanke: Mit dieser Drucktaste wird die gewünschte Triggerflanke gewählt. Bei gelöster Taste erfolgt die Triggerung auf der positiven Flanke des Eingangsignals, bei gedrückter Taste auf der negativen Flanke.

An welchem Punkt die Triggerung erfolgt, hängt von der Einstellung des Stellknopfes TRIGGER LEVEL ab.

Die Breite eines positiven Impulses läßt sich auf einfache Weise wie folgt messen: Eingang A auf positive Flanke und Eingang B auf negative Flanke einstellen, Impuls an Eingang B legen, Funktionswähler auf eine der beiden SINGLE-Funktionen, Schiebeschalter PERIOD B/TIME INT. A TO B auf TIME INT. A TO B sowie SEP/COM auf COM stellen.

Hold off (PM 6622): Dieser Einsteller ermöglicht eine verzögerte Triggerung des Geräts bei der Messung von Einzelperioden und Zeitintervallen. Dadurch werden Fehltriggerungen bei verrauschten Signalen vermieden.

sur O V pour une plus haute — sensibilité, en tirant sur la commande TRIGGER LEVEL.

Cependant, pour la mesure de fréquence en impulsions étroites une tension d'offset limitée peut être requise afin d'obtenir un déclenchement fiable. La mesure de temps requiert un réglage continuellement variable du niveau de déclenchement.

Les douilles de contrôle pour les voies A et B permettent de mesurer le niveau de déclenchement exact.

Si l'atténuateur est réglé sur 200 mV, la gamme du niveau de déclenchement est accrue de 10 fois de  $\pm$  2.5 V à  $\pm$  25 V.

La dénomination "niveau de déclenchement" peut sembler abusive, car le déclenchement n'a pas lieu au niveau de déclenchement réglé, mais au point de déclenchement.

Modes d'entrée Séparée et Commune par B: En position SEP les entrées A et B fonctionnent indépendamment l'une de l'autre sans tenir compte des fonctions, ni des sources d'entrée. En position COM, l'entrée A est déconnectée de son atténuateur et de son amplificateur, et un signal connecté à l'entrée "B" est couplé aux atténuateurs et amplificateurs A et B.

Toutes les spécifications d'entrée B restent identiques, si ce n'est que l'impédance d'entrée qui est de 500 k-ohm déviée à travers 50 pF.

Déclenchement sur pente positive et négative : Ce bouton-poussoir détermine sur quelle pente du signal d'entrée, aura lieu le déclenchement.

En position relâchée le déclenchement a lieu sur la pente positive du signal d'entrée, et en position enfoncée, le déclenchement a lieu sur la pente négative.

Le point de déclenchement est déterminé par la commande TRIGGER LEVEL. La largeur d'une impulsion positive peut être mesurée en réglant l'entrée A sur pente positive et l'entrée B sur pente négative, connecter ensuite l'impulsion à l'entrée B, régler le sélecteur de fonctions sur une des deux positions SINGLE, coulisser le commutateur PERIOD B/TIME INT. A TO B en position TIME INT. A TO B et SEP/COM sur COM.

Retard de déclenchement sur PM 6622 : Cette commande permet le déclenchement retardé de l'appareil pour mesure de période simple et d'intervalle de temps, et ce afin d'éviter un faux déclenchement sur des signaux bruités.

#### **Basic measurements**

#### Self check PM 6622

- Depress CHECK push-button - Rotate FUNCTION SELECTOR and
- read:

Frequency A 100 Hz 00010.0000 MHz 10 Hz 0010.00000 MHz 1 Hz 010000.000 kHz 0.1 Hz 10000.0000 kHz

- Set PERIOD B/TIME INT. A TO B to PERIOD B

Period	В	Ratio A/B
0.1 ms	00000000.0 ms	106 001.000000
0.1 μs	00000.0001 ms	104 00001.0000
10 <sup>2</sup>	000000100 ns	
104	0000100.00 ns	
106	00100.0000 ns	

Count A Start/Stop 000000002

Gated

#### Grundlegende Messungen

#### Eigenkontrolle PM 6622

- Taste CHECK drücken
- Funktionswähler drehen und auf der Anzeige ablesen:

Frequenz A 100 Hz 00010.0000 MHz 10 Hz 0010.00000 MHz 1 Hz 010000.000 kHz 0.1 Hz 10000.0000 kHz

- Schalter PERIOD B/TIME INT. A TO B auf PERIOD B stellen und ablesen:

)
)

Zählung A Start/Stop 000000002 Torgesteuert 000000001

- Tourner le sélecteur de fonctions et . lire:

CHECK

Fréquence A 100 Hz 00010.0000 MHz 10 Hz 0010.00000 MHz

Mesures de base

Auto Contrôle de PM 6622

- Enfoncer le bouton-poussoir

1 Hz 010000,000 KHz 0.1 Hz 10000,0000 KHz

- Mettre PERIOD B/TIME INT. A TO B sur PERIOD B

Périod	e B	Rapport A/B
0.1 ms	00000000.0 ms	106 001.000000
0.1 μs	00000.0001 ms	104 00001.0000
102	000000100 ns	
104	0000100.00 ns	
106	00100.0000 ns	

Comptage A Démarrage/arrêt 000000002 000000001 Déclenché

#### Self check PM 6624

- Depress CHECK push-button

00000001

- Set INPUT A/INPUT C to INPUT A - Rotate FUNCTION SELECTOR and read:

Frequency A 100 Hz 00010.0000 MHz 10 Hz 0010.00000 MHz 1 Hz 010000.000 kHz 0.1 Hz 10000.0000 kHz

- Set PERIOD B/TIME INT. A TO B to PERIOD B

Period B Ratio A/B 0.1 ms 00000000.0 ms 106 001.000000 104 00001.0000  $0.1 \, \mu s \, 00000.0001 \, ms$ 102 000000100 ns 104 0000100.00 ns 106 00100.0000 ns

- Set INPUT A/INPUT C to INPUT C

Ratio C/B 104 00008,0000 106 008.000000

Count A Start/Stop 000000002 Gated 00000001

Frequency C 100 Hz 00080.0000 MHz 10 Hz 0080.00000 MHz 1 Hz 080000.000 kHz 0.1 Hz 80000.0000 kHz

#### Eigenkontrolle PM 6624

- Taste CHECK drücken.
- Schalter INPUT A/INPUT C auf INPUT A stellen.
- Funktionswähler drehen und dabei auf der Anzeige ablesen:

Frequenz A 100 Hz 00010.0000 MHz 10 Hz 0010.00000 MHz 1 Hz 010000.000 kHz 0.1 Hz 10000.0000 kHz

 Schalter PERIOD B/TIME INT. A TO B auf PERIOD B stellen und ablesen:

Periode B Verhältnis A/B 0,1 ms 00000000.0 ms 106 001.000000 104 00001.0000 0,1 µs 00000.0001 ms 102 000000100 ns 104 0000100.00 ns 106 00100.0000 ns

 Schalter INPUT A/INPUT C auf INPUT C stellen und ablesen:

Verhältnis C/B 104 00008 0000 106 008.000000

Zählung A Start/Stop 00000002 Torgesteuert 000000001

Frequenz C 100 Hz 00080.0000 MHz 10 Hz 0080.00000 MHz 1 Hz 080000.000 kHz 0,1 Hz 80000.0000 kHz

#### Auto Contrôle du PM 6624

 Enfoncer le bouton-poussoir CHECK

- Mettre INPUT A/INPUT C sur INPUT A

- Tourner le sélecteur de fonctions et

Fréquence A 100 Hz 00010.0000 MHz 10 Hz 0010.00000 MHz 1 Hz 010000.000 KHz 0.1 Hz 10000.0000 KHz

- Régler PERIOD B/TIME INT. A TO B sur PERIOD B

Période B Rapport A/B 106 001.000000 0.1 ms 00000000.0 ms 104 00**O**01.0000  $0.1 \, \mu s \, 00000.0001 \, ms$ 10<sup>2</sup> 000000100 ns 104 0000100.00 ns

106 00100.0000 ns

- Régler INPUT A/INPUT C sur INPUT C

Rapport C/B 104 00008.0000 106 008.000000

Comptage A Démarrage/arrêt 000000002 000000001 Déclenché

Fréquence C 100 Hz 00080.0000 MHz 10 Hz 0080.00000 MHz 1 Hz 080000.000 KHz 0.1 Hz 80000.0000 KHz

#### Self check PM 6625

- Depress CHECK push-button
- Set INPUT A/INPUT C to INPUT A
- Rotate FUNCTION SELECTOR and read:

Frequency A

100 Hz 00010,0000 MHz

10 Hz 0010.00000 MHz

1 Hz 010000.000 kHz

0.1 Hz 10000,0000 kHz

- Set PERIOD B/TIME INT. A TO B to PERIOD B

Period B

0.1 ms 00000000.0 ms

0.1 µs 00000.0001 ms

102 o00000100 ns

0000100.00 ns 104

106 00100.0000 ns

Ratio A/B 106 001.000000

104 00001.0000

— Set INPUT A/INPUT C to INPUT C Ratio C/B

104 00016.0000 106 016.000000

Count A

Start/Stop 000000002 Gated 00000001

Frequency C

100 Hz 00160.0000 MHz

10 Hz 0160,00000 MHz 1 Hz 160000.000 kHz

0.1 Hz 60000.0000 kHz

#### Frequency A

Simple frequency measurement on sine waves and other symmetrical waveforms.

- Set FUNCTION SELECTOR to desired resolution
- Set INPUT A/INPUT C to INPUT A (only PM 6624 . . . 25)
- Set AC/DC to AC
- Pull TRIGGER LEVEL control
- Set SEP/COM to SEP
- Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1 V<sub>rms</sub>
- Connect the input signal to input A Display will show frequency in kHz or MHz

#### Frequency C PM 6624 and PM 6625

Automatic frequency measurement.

- Set FUNCTION SELECTOR to desired resolution
- Set INPUT A/INPUT C to INPUT C
- Connect the input signal to input C Display will show frequency in MHz or kHz

#### Eigenkontrolle PM 6625

- Taste CHECK drücken.
- Schalter INPUT A/INPUT C auf INPUT A stellen.
- Funktionswähler drehen und dabei auf der Anzeige ablesen:

Frequenz A

100 Hz 00010,0000 MHz

10 Hz 0010.00000 MHz

1 Hz 010000.000 kHz

0.1 Hz 10000,0000 kHz

- Schalter PERIOD B/TIME INT. A TO B auf PERIOD B stellen und ablesen:

Periode B

Verhältnis A/B

0.1 ms 00000000.0 ms

106 001.000000 104 00001.0000

 $0,1~\mu s$  00000.0001 ms 102 000000100 ns

104 0000100.00 ns

106 00100.0000 ns

- Schalter INPUT A/INPUT C auf INPUT C stellen und ablesen:

Verhältnis C/B

104 00016.0000 106 016.000000

Zählung A

Start/Stop 000000002 Torgesteuert 00000001

Frequenz C

100 Hz 00160,0000 MHz

10 Hz 0160,00000 MHz

1 Hz 160000.000 kHz

0,1 Hz 60000.0000 kHz

#### Frequenz A

Einfache Messungen an sinusförmigen und anderen symmetrischen Signalformen.

- Funktionswähler auf gewünschte Auflösung stellen.
- INPUT A/INPUT C auf INPUT A stellen (nur PM 6624 und PM 6625).
- AC/DC auf AC stellen.
- Einsteller TRIGGER LEVEL ziehen.
- SEP/COM auf SEP stellen.
- 20 mV/200 mV auf 200 mV stellen, wenn das Eingangsignal größer ist als 1 V<sub>eff</sub>.
- Eingangsignal an Eingang A legen. Die Frequenz ist dann auf der Anzeige in kHz oder MHz abzulesen.

#### Frequenz C an PM 6624 und PM 6625

Automatische Frequenzmessung.

- Funktionswähler auf gewünschte Auflösung stellen.
- INPUT A/INPUT C auf INPUT C stellen.
- Eingangsignal an Eingang C legen. Die Frequenz ist dann auf der Anzeige in kHz oder MHz abzulesen.

#### Auto Contrôle du PM 6625

- Enfoncer le bouton-poussoir **CHECK** 

- Régler INPUT A/INPUT C sur INPUT A

- Tourner le sélecteur de fonctions et

Fréquence A

100 Hz 00010.0000 MHz

10 Hz 0010.00000 MHz

1 Hz 010000.000 KHz

0.1 Hz 10000.0000 KHz

— Régler PERIOD B/TIME INT. A TO B sur PERIOD B

Rapport A/B Période B

0.1 ms 00000000.0 ms 106 001.000000

104 00001.0000 0.1 us 00000.0001 ms

102 000000100 ns 104

0000100.00 ns

106 00100.0000 ns

- Régier INPUT A/INPUT C sur

INPUT C Rapport C/B

104 00016.0000

106 016.000000

Comptage A

Démarrage/arrêt 000000002

Déclenché 00000001

Fréquence C

100 Hz 00160.0000 MHz

10 Hz 0160.00000 MHz

1 Hz 160000.000 KHz

0.1 Hz 60000.0000 KHz

#### Fréquence A

Mesure de fréquence simple sur ondes sinusoïdales et autres ondes symétriques :

- Régler le sélecteur de fonctions sur la résolution requise
- Mettre INPUT A/INPUT C sur IN-PUT A (pour PM 6624 et PM 6625 seulement)
- Mettre AC/DC sur AC
- Tirer sur la commande TRIGGER LEVEL
- Mettre SEP/COM sur SEP
- Mettre 20 mV/200 mV sur 200 mV si l'amplitude du signal d'entrée est supérieure à 1 V<sub>eff</sub>
- Connecter le signal d'entrée à l'entrée A

L'affichage indiquera la fréquence en KHz ou en MHz

#### Fréquence C pour PM 6624 et PM 6625

Mesure de fréquence automatique

- Mettre le sélecteur de fonctions sur la résolution requise
- Mettre INPUT A/INPUT C sur IN-PUT C

#### Period B

Simple period measurement on sine waves and other symmetrical waveforms.

- Set FUNCTION SELECTOR to SINGLE or AVG measurement
- Set PERIOD B/TIME INT. A TO B to PERIOD B
- Pull TRIGGER LEVEL
- Set AC/DC to AC
- Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1  $\rm V_{rms}$
- Select positive slope triggering
- Connect the signal to input B

Display will show period time in ms or ns

#### Time Interval A to B

Simple measurement of time interval between pulses at input A and B from separate sources.

- Set FUNCTION SELECTOR to SINGLE or AVG
- Set PERIOD B/TIME INT. A TO B to TIME INT. A TO B
- Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 3  $V_{\rm n,n}$
- than 3  $V_{p-p}$  Set AC/DC to DC
- Set SEP/COM to SEP
- Select positive slope triggering
- Set TRIGGER LEVEL potentiometer to suitable trigger level e.g. 50 % of the pulse amplitude
- Connect the pulses to input A and B Display will show the time interval in ms or ns

#### Ratio A/B

Simple ratio measurement on sine wave or other symmetrical waveforms.

- Set FUNCTION SELECTOR to 10<sup>4</sup> or 10<sup>6</sup>
- Pull TRIGGER LEVEL control
- Set AC/DC to AC
- Set SEP/COM to SEP
- Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1  $V_{\rm rms}$
- Connect the signal with the highest frequency to input A and the other signal to input B

Display will show the ratio of the signal frequences at input A and B

#### Ratio C/B PM 6624 and PM 6625

Simple ratio measurement on sine wave and other symmetrical waveforms.

- Set FUNCTION SELECTOR to 10<sup>4</sup> or 10<sup>6</sup>
- Set INPUT A/INPUT C to INPUT C
- Pull TRIGGER LEVEL control
- Set SEP/COM to SEP
- Set AC/DC to AC
- Set 20 mV/200 mV to 200 mV if the

#### Periode B

Einfache Periodenmessung an sinusförmigen und anderen symmetrischen Signalformen.

- Funktionswähler auf SINGLE oder AVG stellen.
- PERIOD B/TIME INT. A TO B auf PERIOD B stellen.
- Einsteller TRIGGER LEVEL ziehen.
- AC/DC auf AC stellen.
- 20 mV/200 mV auf 200 mV stellen, wenn das Eingangsignal größer ist als 1 V<sub>oss</sub>.
- 1 V<sub>eft</sub>.

   Triggerung auf positiver Flanke wählen.
- Signal an Eingang B legen. Die Periodendauer ist dann auf der Anzeige in ms oder ns abzulesen.

#### Zeitintervall A—B

Einfache Messungen des Zeitintervalls zwischen Impulsen von getrennten Quellen an Eingang A und Eingang B.
— Funktionswähler auf SINGLE oder AVG stellen.

- -- PERIOD B/TIME INT. A TO B auf TIME INT. A TO B stellen.
- 20 mV/200 mV auf 200 mV stellen, wenn das Eingangsignal größer ist als  $3 \ V_{\odot}$
- AC/DC auf DC stellen.
- SEP/COM auf SEP stellen.
- Triggerung auf positiver Flanke wählen.
- Potentiometer TRIGGER LEVEL auf einen passenden Triggerpegel einstellen, z.B. 50 % der Impulsamplitude.
- Impulse an Eingang A bzw. Eingang B legen. Das Zeitintervall ist dann auf der Anzeige in ms oder ns abzulesen.

#### Verhältnis A/B

Einfache Verhältnismessung an sinusförmigen oder anderen symmetrischen Signalformen.

- Funktionswähler auf 10<sup>4</sup> oder 10<sup>6</sup> stellen.
- Potentiometer TRIGGER LEVEL ziehen.
- AC/DC auf AC stellen.
- SEP/COM auf SEP stellen.
- 20 mV/200 mV auf stellen, wenn das Eingangsignal größer ist als 1  $V_{\rm eff}$ .
- Signal mit der höheren Frequenz an Eingang A, das andere Signal an Eingang B legen.

Das Verhältnis der Signalfrequenzen an Eingang A und B ist dann auf der Anzeige abzulesen.

## Verhältnis C/B an PM 6624 und PM 6625

Einfache Verhältnismessung an sinusförmigen oder anderen symmetrischen Signalformen. Connecter le signal d'entrée à l'entrée C

#### Période B

Mesures de période simple sur ondes sinusoïdales et autres ondes symétriques

- Régler le sélecteur de fonctions sur SINGLE (simple) ou sur AVG (moyenne)
- Régler PERIOD B/ TIME INT. A TO B sur PERIOD B
- Tirer la commande TRIGGER LEVEL (niveau de déclenchement)
- Mettre AC/DC sur AC
- Régler 20 mV/200mV sur 200 mV si l'amplitude du signal d'entrée est supérieure à 1  $V_{\rm eff}$
- Sélectionner le déclenchement sur pente positive
- Connecter le signal à l'entrée B
   L'affichage indique le temps de période en ms ou en ns

#### Intervalle de temps A à B

Mesure simple de temps entre impulsions aux entrées A et B à partir de sources séparées

- Mettre le sélecteur de fonctions en position SINGLE ou AVG
- Mettre PERIOD B/TIME INT. A TO B sur TIME INT. A TO B
- Régler 20 mV/200 mV sur 200 mV si l'amplitude du signal d'entrée est supérieure à 3 V
- rieure à 3 V<sub>c-c</sub>
   Mettre AC/DC sur DC
- Mettre SEP/COM sur SEP
- Sélectionner le déclenchement sur pente positive
- Régler le potentiomètre TRIGGER LEVEL au niveau approprié, par ex 50 % de l'amplitude d'impulsion
- Connecter les impulsions aux entrées A et B
- L'affichage indiquera l'intervalle de temps en ms ou en ns

#### Rapport A/B

Mesure simple de rapport sur onde sinusoïdale ou autres ondes symétriques

- Mettre le sélecteur de fonctions sur 10<sup>4</sup> ou 10<sup>6</sup>
- Tirer la commande TRIGGER LEVEL
- Mettre AC/DC sur AC
- Mettre SEP/COM sur SEP
- Mettre 20 mV/200 mV sur 200 mV si l'amplitude du signal d'entrée est supérieure à 1 V<sub>eff</sub>
- Connecter le signal à fréquence la plus haute à l'entrée A, et l'autre signal à l'entrée B

L'affichage indiquera le rapport des fréquences de signaux aux entrées A et B

amplitude of the input signal is higher than 1  $V_{\rm rms}$ 

— Connect the signal with the highest frequency to input C and the other to input B

Display will show the ratio of the signal frequencies at input C and B

#### Count A Start/Stop and Gated by B

Simple Start/Stop and Gated by B measurement on sine wave and other symmetrical waveforms.

- Set FUNCTION SELECTOR to COUNT A
- Pull TRIGGER LEVEL control
- Set AC/DC to AC for channel A
- Set AC/DC to DC for channel B
- Set SEP/COM to SEP
- Set 20 mV/200 mV to 200 mV if the amplitude of the input signal is higher than 1  $\rm V_{rms}$
- Select positive slope triggering
- Select Start/Stop by B (upper position) or Gated by B (lower position)
- Connect gating signal to input B and the other signal to input A In Start/Stop operation the display will show the accumulated number of counts in the time interval between the Start/Stop signals, and in the Gated mode the accumulated number of counts during the positive and negative slopes of the Gating signal

#### Hold off PM 6622

- Set FUNCTION SELECTOR to 0.1  $\mu$ s and rotate HOLD OFF control from fully CCW to fully CW position
- Read hold off time from 0.01 to 0.5 ms on the display with knob pushed and 0.5 ms to 100 ms with knob pulled

- Funktionswähler auf 10<sup>4</sup> oder 10<sup>6</sup> stellen.
- INPUT A/INPUT C auf INPUT C stellen.
- Potentiometer TRIGGER LEVEL ziehen.
- SEP/COM auf SEP stellen.
- AC/DC auf AC stellen.
- 20 mV/200 mV auf 200 mV stellen, wenn das Eingangsignal größer ist als 1 V
- 1 V<sub>eff</sub>.
   Signal mit der höheren Frequenz an Eingang C, das andere an Eingang B legen.

Das Verhältnis der Signalfrequenzen an Eingang C und B ist dann auf der Anzeige abzulesen.

## Zählung zwischen Start/Stopp oder torgesteuert von B

Einfache Zählung (Summenbildung) an sinusförmigen oder anderen symmetrischen Signalformen.

- Funktionswähler auf COUNT A stellen.
- Einsteller TRIGGER LEVEL ziehen.
- AC/DC für Kanal A auf AC stellen.
- AC/DC für Kanal B auf DC stellen.
- SEP/COM auf SEP stellen.
- 20 mV/200 mV auf 200 mV stellen, wenn das Eingangsignal größer ist als  $1 V_{off}$ .
- Triggerung auf positiver Flanke wählen.

Im Start/Stopp-Betrieb erscheint auf der Anzeige die zwischen Start- und Stoppsignal summierte Zahl der Impulse. Bei Torsteuerung wird die Summe der Impulse während der positiven und der negativen Flanke des Torsignals gebildet.

#### Triggerverzögerung PM 6622

- Funktionswähler auf 0,1 μs stellen und Einsteller HOLD OFF vom Linksanschlag bis Rechtsanschlag drehen.
- Verzögerungszeiten von 0,01 bis 0,5 ms sind dann bei eingedrücktem Knopf abzulesen, Zeiten von 0,5 bis 100 ms bei gezogenem Knopf.

## Rapport C/B pour PM 6624 et PM 6625

Mesure de rapport simple sur onde sinusoïdale et autres ondes symétriques

- Mettre le sélecteur de fonctions sur 10<sup>4</sup> et 10<sup>6</sup>
- Mettre INPUT A/INPUT C sur IN-PUT C
- Tirer la commande TRIGGER LEVEL
- Mettre SEP/COM sur SEP
- Mettre AC/DC sur AC
- Régler 20 mV/200 mV sur 200 mV si l'amplitude de signal d'entrée est supérieure à 1  $\rm V_{eff}$
- Connecter le signal à fréquence la plus haute à l'entrée C et l'autre à l'entrée B

L'affichage indiquera le rapport des fréquences de signaux aux entrées C et B

## Comptage A Démarrage/arrêt et Déclenchement par B

Mesure simple arrêt/démarrage et déclenchement par B sur onde sinusoïdale et autres ondes symétriques

- Mettre le sélecteur de fonctions sur COUNT A
- Tirer la commande TRIGGER LEVEL
- Mettre AC/DC sur AC pour voie A
- Mettre AC/DC sur DC pour voie B
- Mettre SEP/COM sur SEP
- Mettre 20 mV/200 mV sur 200 mV si l'amplitude du signal d'entrée est supérieure à 1  $\rm V_{eff}$
- Sélectionner le déclenchement sur pente positive
- Sélectionner arrêt/démarrage par B (position supérieure) ou déclenchement par B (position inférieure)
- Connecter le signal de déclenchement à l'entrée B et l'autre signal à l'entrée A

En mode démarrage/arrêt, l'affichage indique le nombre de comptages accumulés dans l'intervalle de temps entre les signaux démarrage/arrêt; et en mode de déclenchement, l'affichage indique le nombre de comptages accumulés pendant les pentes positives et négatives du signal de déclenchement (gating)

#### Retard de déclenchement du PM 6622

- Mettre le sélecteur de fonctions sur 0.1  $\mu s$  et tourner la commande HOLD OFF de position extrême gauche en position extrême droite.
- Lire le temps de retard de 0.01 à 0.5 ms sur l'affichage avec le bouton en position enfoncée, et de 0.5 ms à 100 ms avec le bouton en position tirée.

#### Self check of measuring modes

#### Preliminary setting of the controls

- Release all push-buttons
- Minimum display time
- Pull the trigger level controls
- Hold off to position off
- Internal oscillator on
- Self check on

#### Frequency A

- Do the preliminary setting of the controls
- Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Frequency A 100 Hz	blinking	MHz	00010.0000
Frequency A 10 Hz	blinking		0010.00000
Frequency A 1 Hz	blinking		010000.000
Frequency A 0.1 Hz	blinking		10000.0000

#### Frequency C PM 6624

- Do the preliminary setting of the controls
- Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Frequency C 100 Hz Frequency C 10 Hz Frequency C 1 Hz Frequency C 0.1 Hz	blinking	MHz MHz kHz	00080.0000 0080.00000 080000.000 80000.0000

#### Frequency C PM 6625

- Do the preliminary setting of the controls
- Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Frequency C 100 Hz Frequency C 10 Hz Frequency C 1 Hz Frequency C 0.1 Hz	blinking blinking (slow rate)		00160.0000 0160.00000 160000.000 60000.0000

#### Single Period B

- Do the preliminary setting of the controls
- Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Period B 0.1 ms	blinking	ms	<b>00000000.0</b> 00000.0001
Period B 0.1 μs	blinking	ms	

#### Period Average B

- Do the preliminary setting of the controls
- Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Period B 10 <sup>2</sup>	blinking	ns	00000100.
Period B 10 <sup>4</sup>	blinking	ns	0000100.00
Period B 10 <sup>6</sup>	blinking	ns	00100.0000

#### Single Time Interval A to B

- Do the preliminary setting of the controls
- Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Time Int. 0.1 ms	blinking	ms	00000000.0
Time Int. 0.1 μs	blinking	ms	00000.0001

#### Time Interval Average A to B

- Do the preliminary setting of the controls
- Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Time Int. 10 <sup>2</sup>	blinking	ns	000000000 or any value
Time Int. 104	blinking	ns	00.00000.00
Time Int. 10 <sup>6</sup>	blinking	ns	or any value 00000.0000 or any value

#### Ratio A/B

- Do the preliminary setting of the controls
- Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Ratio A/B 10 <sup>6</sup>	blinking	off	001.000000
Ratio A/B 10 <sup>4</sup>	blinking	off	0000.10000

#### Ratio C/B PM 6624

- Do the preliminary setting of the controls
- Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Ratio C/B 10 <sup>6</sup>	blinking	off	008.00000
Ratio C/B 10 <sup>4</sup>	blinking	off	00008.0000

#### Ratio C/B PM 6625

- Do the preliminary setting of the controls
- Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Ratio C/B 10 <sup>6</sup>	blinking	,	016.000000
Ratio C/B 10 <sup>4</sup>	blinking		00016.0000

#### Count A

- Do the preliminary setting of the controls
- Perform the test below

Function Selector	Gate lamp	Unit lamp	Display (±1 digit)
Count A  B	blinking blinking	off off	000000002 000000001 or 000000000

#### Functional test of sockets and controls

#### Preliminary setting of the controls

- Release all push-buttons
- Minimum display time
- Pull the trigger level controls
- Hold off to position off
- Internal oscillator on

#### Display time

- Do the preliminary setting of the controls
- Set the function selectors to Frequency A 1 Hz
- Note that flashing frequency of the Gate lamp decreases from one flash every second to one flash every five seconds when the Display Time potentiometer is turned from the min. time position to max. time position.

#### Memory

- Do the preliminary setting of the controls
- Set the Function Selectors to Frequency A 1 Hz
- Set Display Time to max. position
- Observe the display and check that the counter is counting during 1 second and displays 10 000 kHz during 4 seconds when Memory push-button is depressed.

#### Reset

- Do the preliminary setting of the controls
- Set the Function Selectors to Frequency A 0.1 Hz
- Depress Memory push-button
- Check that counter displays zero as long as the Reset push-button is depressed.

#### Display digits

- This test requires a 80 MHz pulse generator
- Do the preliminary setting of the controls
- Set the function selectors to Count A Gated by B
- Depress Memory push-button
- Set Trigger Level B to +2.5 V
- Connect Sync Out from the pulse generator to Input A
- Set the pulse generator to a repetition time of 1 second
- Check that digit N:0 9 is displaying all numbers from 0 to 9 when the Trigger Level B control is set from the +2.5 V position to the -2.5 V position
- Depress Reset push-button
- Set Trigger Level B control to the +2.5 V position
- Vary the Repetition Time of the pulse generator and check the remaining 8 digits as shown in table below

Digit N:o	1 (MSD)	2	3	4
Rep. time	12 ns	100 ns	1 μs	10 μs

Digit N:o	5	6	7	8	9 (LSD)
Rep. time	100 μs	1 ms	1.0 ms	100 ms	1 s

#### Trigger Level A and B

This test requires a voltmeter

- Do the preliminary setting of the controls
- Perform the test below

Trigger Level A setting	Measured voltage Monitor socket A	Trigger lamp A
-2.5 V position	-2.3 V2.7 V	off
+2.5 V position	+2.3 V +2.7 V	on

Repeat the test for Trigger Level B

#### Hold off PM 6622

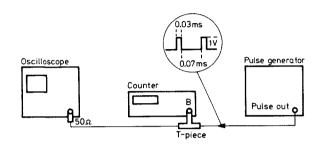
- Do the preliminary setting of the controls
- Set the Function Selectors to Period B 0.1 µs
- Perform the test below

Hold off setting	Displayed value
10 μs	less than 10 μs
500 μs 0.5 ms	more than 500 μs less than 500 μs
100 ms	more than 100 ms

#### Positive and negative slopes A and B

This test requires a low frequency oscilloscope, a pulse generator and a BNC T-piece.

- Do the preliminary setting of the controls
- Set Function Selectors to Time Interval 0.1 μs
- Depress AC/DC push-buttons
- Set Trigger Levels A and B to approximately 0.5 V



- Set the output signal from the pulse generator to an amplitude of 1 V, a repetition time of 0.1 ms and a duty factor of 0.3
- Perform the test below

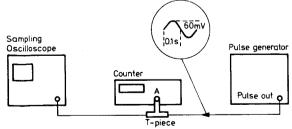
Slope setting channel A	Slope setting channel B	Displayed value
5	<	00000.1000 ms 00000.0300 ms
$\gtrsim$	>	00000.1000 ms 00000.0700 ms

#### Sine wave sensitivity and ac/dc coupling Input A

This test requires a sine wave generator with a frequency range of 10 Hz to 80 MHz, a high frequency oscilloscope and a T-piece.

- Do the preliminary setting of the controls
- Set the Function Selectors to Frequency A 1 Hz

#### Test set up for 80 MHz measurement



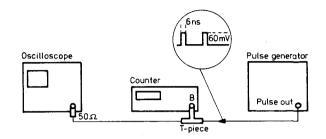
— Set the output signal from the sine wave generator to an amplitude of 60 mV $_{\rm p-p}$  and a frequency of 10 Hz — Perform the test below

Sine wave frequency	Coupling ac or dc	Displayed value
10 Hz	ac	000000.000 kHz
10 Hz	dc	000000.010 kHz
100 Hz	dc	000000.100 kHz
100 kHz	dc	000100.000 kHz
80 MHz	dc	080000.000 kHz

#### Pulse sensitivity Input B

This test requires a 3 MHz pulse generator, a low frequency oscilloscope and a T-piece.

- Do the preliminary setting of the controls
- Set Input B to dc coupling and the Function Selectors to Period B 10<sup>2</sup>



- Set the pulse generator:

Amplitude: 60 mV Pulse width: 6 ns Frequency: 100 Hz Pulse mode: normal Polarity: positive

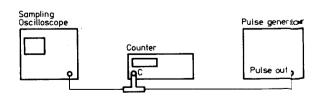
— Adjust Trigger Level control B until counter displays correct display read out according to the table below

Pulse generator frequency	Function selector	Displayed value
100 Hz	Period B 10 <sup>2</sup>	001000000 ns
100 kHz	Period B 10 <sup>4</sup>	0010000.00 ns
3 MHz	Period B 10 <sup>6</sup>	00333.0000 ns

#### Sine wave sensitivity Input C PM 6624

This test requires a sine wave generator with a frequency range of 50 MHz to 520 MHz, a high frequency oscilloscope and a T-piece.

- Do the preliminary setting of the controls
- Set the Function Selectors to Frequency C 10Hz



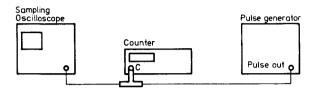
### - Perform the test below

Sine wave frequency	Sine wave amplitude	Displayed value
50 MHz	30 mV <sub>p-p</sub>	0050.00000 MHz 0200.00000 MHz
200 HMz 520 MHz	30 mV <sub>p-p</sub> 30 mV <sub>p-p</sub>	0520.00000 MHz

#### Sine wave sensitivity Input C PM 6625

This test requires a sine wave source with a frequency range of 50 MHz to 1 000 MHz, a high frequency oscilloscope and a T-piece.

- Do the preliminary setting of the controls
- Set the Function Selectors to Frequency C 10 Hz



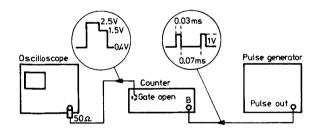
#### - Perform the test below

Sine wav	· 1 -	Displayed value
50 MH 400 MH 960 MH 1 000 MH	z 30 mV <sub>p-p</sub> z 30 mV <sub>p-p</sub>	0050.00000 MHz 0400.00000 MHz 0960.00000 MHz 1000.00000 MHz

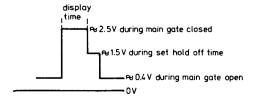
#### Gate open PM 6622

This test requires a low frequency oscilloscope, a pulse generator and a T-piece.

- Do the preliminary setting of the controls
- Set the Function Selectors to Time Interval A to B 0.1 ms, the Hold Off time to 100 ms and depress SEP/ COM push-button
- Set the amplitude of the output signal from the pulse generator to 1 V, the repetition time to 0.1 ms and the duty factor to 0.3



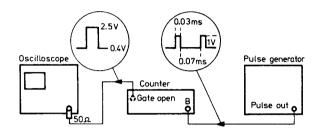
Check that the oscilloscope displays the wave form below



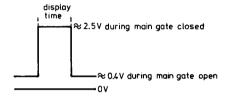
#### Gate open PM 6624 and PM 6625

This test requires a low frequency oscilloscope, a pulse generator and a BNC T-piece

- Do the preliminary setting of the controls
- Set Function Selectors to Time Interval A to B
   0.1 ms and depress SEP/COM push-button
- Set the output signal from the pulse generator to an amplitude of 1 V, a repetition time of 0.1 ms and a duty factor of 0.3



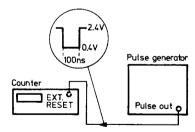
— Check that the oscilloscope displays the wave form below



#### External reset

This test requires a pulse generator with dc offset

- Do the preliminary setting of the controls
- Set the function selectors to Frequency A 10 Hz
- Set the Function Selectors to Frequency A 10 Hz
- Pull Display Time switch
- Depress Check push-button
- Set the pulse generator to single shot and inverted pulse mode
- Set the pulse to a width of 100 ns, an amplitude of 2 V and +0.4 V dc offset.



Check that the Gate lamp is blinking and that digit
 N:o 1 (MSD) displays zero each time push-button
 Single Shot is depressed

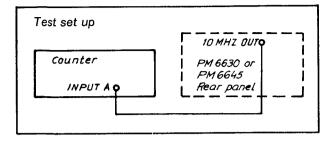
#### 10 MHz Out

This test requires a low frequency oscilloscope and a 500  $\Omega$  probe.

- Do the preliminary setting of the controls
- Connect the oscilloscope to socket D and check that the oscilloscope displays a wave form with an amplitude of 1.8  $V_{p-p}$  and a frequency of 10 MHz.

### Oscillator PM 9677

#### Oscillator frequency check



— This check requires a frequency standard having an accuracy of  $1 \times 10^{-6}$ . The oven enclosed oscillators Philips PM 9680, PM 9681 and PM 9690 meet this requirement. The check should preferably be made at an ambient temperature of  $+25^{\circ}$  C.

- Set the controls of the counter:

FUNCTION SELECTOR: FREQUENCY A 1 Hz

TRIGGER LEVEL A: pulled

— Check that display shows 10000.000 kHz  $\pm$ 10 Hz.

#### Oscillator frequency adjustment

This adjustment requires a reference oscillator having an accuracy of  $\leq 1 \times 10^{-6}$ .

The oven enclosed PHILIPS oscillators PM 9680\*, PM 9681\* and PM 9690\* meet this requirement.

The adjustment should preferably be made at an ambient temperature of  $+25^{\circ}$  C.

- Remove the bottom cover of the counter.
- Connect the reference signal available at socket 10 MHz OUT of the external counter to INPUT A of the counter to be adjusted.
- Set the controls of the counter to be adjusted: FUNCTION SELECTOR: FREQUENCY A 1 Hz

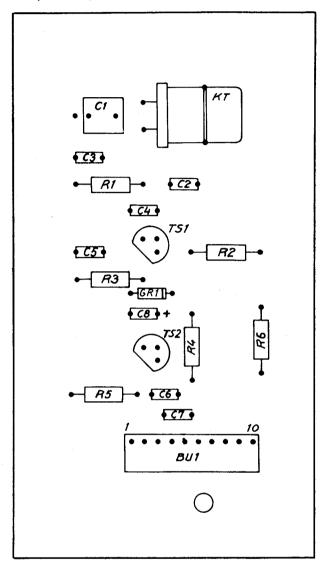
TRIGGER LEVEL A: pulled

— Adjust trimming capacitor C 1 to 10000.000 kHz plus or minus 10 Hz.

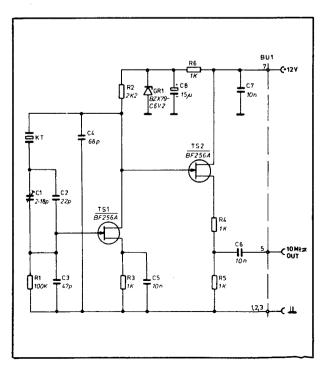
#### Spare parts

Ω/F	%	V/W	Item
100k 2,2k 1k 1k 1k 1k 2—18 22p 47p 68p 10n 10n 10n	2 2 2 2 20+50 20+50		R1 R2 R3 R4 R5 R6 C1 C2 C3 C4 C5 C6 C7
Descr	iption		Item
BF 25 BZX7 Cryst	56 A 9—C6V2 al 10MHz		TS1 TS2 GR1 BU1
	100k 2,2k 1k 1k 1k 1k 2—18 22p 47p 68p 10n 10n 15µ Descr BF 25 BF 25 BZX7 Cryst	100k 5 2,2k 5 1k 5 1k 5 1k 5 1k 5 2—18p 22p 2 47p 2 68p 2 10n —20+50 10n —20+50 10n —20+50	100k 5 CR25 2,2k 5 CR25 1k 5 CR25 2—18p 300 22p 2 100 47p 2 100 68p 2 100 10n —20+50 100 10n —20+50 100 10n —20+50 100 15μ —10+50 16   Description  BF 256 A BF 256 A BZX79—C6V2 Crystal 10MHz

#### Component layout

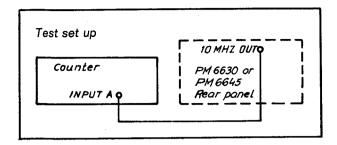


#### Circuit diagram



#### Oscillator PM 9678

#### Oscillator frequency check



— This check requires a frequency standard having an accuracy of  $1 \times 10^{-7}$ .

The oven enclosed oscillators Philips PM 9680, PM 9681 and PM 9690 meet this requirement.

The check should preferably be made at an ambient temperature of  $\pm 25^{\circ}$  C.

- Set the controls of the counter:

FUNCTION SELECTOR: FREQUENCY A 0.1 Hz TRIGGER LEVEL A: pulled

— Check that the display shows 10000.0000 kHz  $\pm$  1 Hz.

#### Oscillator frequency adjustment

— This adjustment requires a reference oscillator having an accuracy of  $\leq 1 \times 10^{-7}$ .

The oven enclosed PHILIPS oscillator PM 9680\*, PM 9681\* and PM 9690\* meet this requirement.

The adjustment should preferably be made at an ambient temperature of  $+25^{\circ}$  C.

- Remove the bottom cover of the counter.
- Connect the reference signal available at socket 10 MHz OUT of the external counter to INPUT A of the counter to be adjusted.
- Set the controls of the counter to be adjusted: FUNCTION SELECTOR: FREQUENCY A 1 Hz

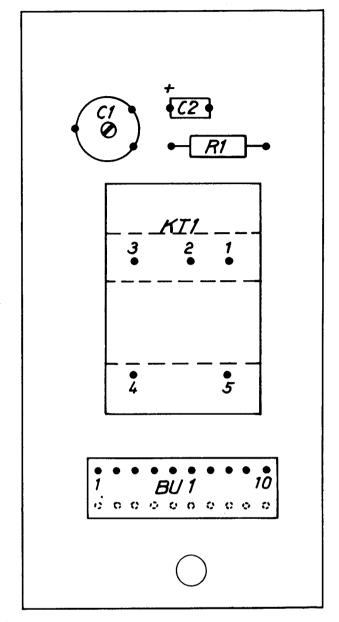
TRIGGER LEVEL A: pulled

- Adjust trimming capacitor C1 to 10000.000 kHz plus or minus 1 Hz.
- Set FUNCTION SELECTION to position 0.1 Hz and check that display read out is the same as before. If not, adjust C 1 slightly to correct frequency.

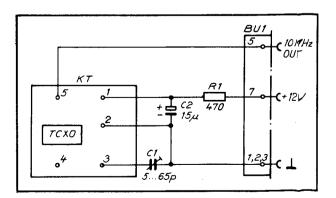
#### Spare parts

Ordering number	Description	Item
4822 110 63098	470 Ω 5 %	R 1
5322 125 50057	5—65 P 100	V C1
5322 124 14036	15 M 10 + 50 % 16	6V C2
5322 267 64031	Connector	BU 1
5322 216 94047	Crystal 10 MHz	

#### Component layout

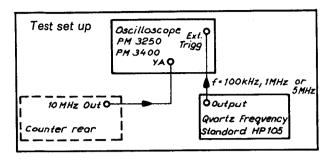


#### Circuit diagram



### Oven Oscillators PM 9679B, PM 9690 and PM 9691

#### Oscillator frequency adjustment



This adjustment requires a frequency standard having an accuracy of  $3\times10^{-8}$  for PM 9679B,  $10^{-9}$  for PM 9690 and better than  $5\times10^{-10}$  for PM 9691. Hewlett-Packard quartz frequency standard HP 105\* meets this requirement.

The adjustment should preferably be made at an ambient temperature of 25°C and the oscillator must have been operating continuously 72 h before any adjustment is made.

- Remove the bottom cover of the counter
- Do the test set up
- Set the oscilloscope to 100 ns/div and adjust the oscillator's fine trimmer until the waveform on the oscilloscope moves with a velocity of maximum 1 div/ 10 s (0.1 Hz).

If the adjustment range is too narrow a coarse trimmer is available under the oscillator's text plate.

#### Repair of the oscillator

— Repair of this oscillator may not be carried out by the local service organisations. In case of breakdown the complete sealed oscillator box has to be sent to the factory for repair.

Factory address:

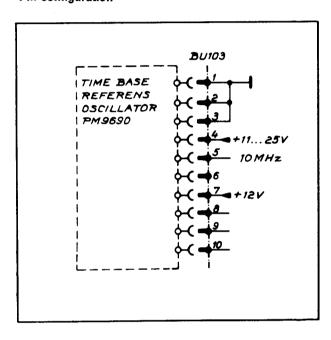
PHILIPS ELEKTRONIKINDUSTRIER AB INDUSTRIAL OPERATIONS

**FACK** 

S-175 20 JARFALLA

**SWEDEN** 

#### Pin configuration



<sup>\*</sup> To be adjusted against a frequency standard such as Droitwich or HBG.

#### Power supply

#### General

The power supply operates from 115 V AC or 230 V AC 50 to 400 Hz or from the internal battery PM 9673 or from an external battery with an output voltage of 12 to 28 V. It provides five stabilised and overload-protected voltages of +120 V, +12 V, +5 V, —5 V and —50 V.

The power supply may be divided into the power input circuit mainly consisting of the mains transformer T 101 and rectifier GR 167, the over-voltage protection circuit mainly consisting of thyristor TS 150, TS 151 and zener diode GR 160, the voltage regulation circuit mainly consisting of voltage regulator IC 150, thyristor TS 154, the DC-to-DC converter mainly consisting of primary side of transformer T 102, driver TS 152 and switch TS 153.

#### Power input circuit

When the power supply operates from the *mains*, the 115 V AC or 230 V AC is transformed to 20 V AC by transformer T 101, rectified in the diode-bridge GR 167, filtered by C 152 and C 161 and fed to the power supply circuits via switch SK 121 and SK 102.

When the power supply operates from an external battery the current to the power supply circuits is fed from BU 21 at the rear panel via protecting diode GR 164 and switches SK 121 and SK 102.

When the internal battery is used the current is fed from pin 8 of BU 105 via SK 121 and SK 102 to the power supply circuits.

#### D.c. to d.c. converter

The DC to DC converter is basically a blocking oscillator consisting mainly of switch transistor TS 153 and terminals 4—9 of the transformer T 102. When switch SK 102 is set to position ON, the DC voltage from the power input circuit is fed to the transistor TS 155 which works as a constant current source of approximately 1 mA  $(I_1)$ .

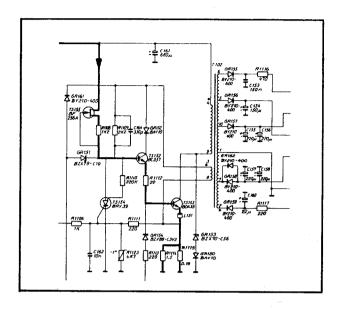
The current  $l_1$  will cause switch transistor TS 153 to start conducting and the linearly increasing current  $l_2$  to flow

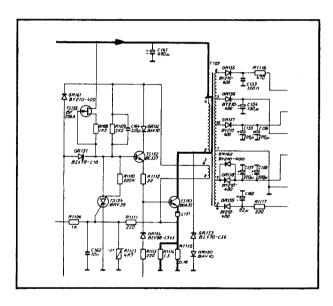
This current  $l_2$  will cause a voltage across terminals 3—8 of the transformer and the current  $l_3$  will start to flow.

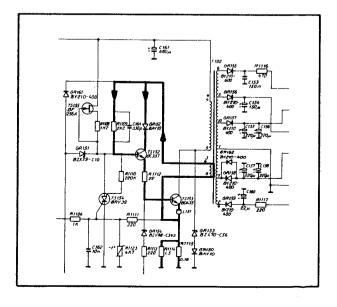
This will cause drive transistor TS 152 to saturate switch transistor TS 153. When the transistor no longer can saturate, current  $I_3$  will stop to increase and the induced voltage at terminal 3 of transformer T 102 will disappear.

This will cause TS 153 to switch off and the collector voltage to rise to the same level as the supply voltage. At this moment the magnetic flux will discharge through the secondary windings of T 102 and diodes GR 155—159.

#### Current paths in d.c. to d.c. converter







### Power supply

#### Over voltage protection

The over-voltage protection circuit consists mainly of thyristors TS 150, TS 151 and zener diode GR 160. The anode of GR 160 is connected to the  $+5\,\text{V}$  output from the power supply. If this voltage increases to  $5.6\,\text{V}\ldots5.8\,\text{V}$ , the zener diode GR 160 will start to conduct and a current will flow through resistor R 1121. The voltage drop across R 1121 is fed to the gate of thyristor TS 151 via resistor R 1120. The anode is connected to the  $+5\,\text{V}$  output voltage via resistor R 1118.

The thyristor will switch on and a voltage drop arises across resistor R 1122. This voltage is fed to the gate of thyristor TS 150, whose anode is connected to the d.c. input voltage. The thyristor will switch on and blow fuse VL 150, or, if the counter is operating in the internal battery mode, fuse VL 1 in the battery unit PM 9673. The capacitor across the gate and cathode of thyristor TS 151 prevents transients from the mains to blow fuse VL 150 accidentally.

#### Output voltage regulation circuit

The output voltage regulation circuit consists mainly of voltage regulator IC 150 and thyristor TS 154.

The purpose of the thyristor TS 154 is to switch off the drive transistor TS 152 in order to regulate the output voltage. The switching moment of thyristor TS 154 is determined by a voltage at the gate of the thyristor which is the sum of a DC regulation voltage from terminal 10 of IC 150 and a sawtooth voltage caused by the emitter current of TS 153 through resistor R 1114//R 1115.

The voltage regulator IC 150 is fed at terminal 12 with the supply voltage and at terminal 7 with a negative voltage, via GR 161, from winding 3—8 of transformer T 102.

IC 150 contains a differential amplifier with inputs at terminals 4 and 5.

The input at terminal 5 is grounded via R 1104 and the input at terminal 4 is connected to a voltage divider that consists of the reference output at terminal 6 and the negative voltage from winding 3—8 of transformer T 102 at terminal 7.

The differential amplifier is in balance when the voltage at terminal 7 is —5 V. When the supply voltage across windings 4—9 of transformer T 102 increases, the voltage at the differential amplifier at terminal 7 of IC 150 will go more negative, the DC regulation voltage at terminal 10 of IC 150 will go positive and turn on thyristor TS 154. This will connect the base of driver transistor to the ground and cause switch transistor TS 153 to switch off. The stored magnetic flux will then discharge in the secondary windings of T 102 and diodes GR 155—GR 159.

#### Replacing parts in the power supply

When replacing parts in the power supply, in particular IC 150, always check the  $\pm 5.0 \text{ V}$  supply.

#### Proceed as follows:

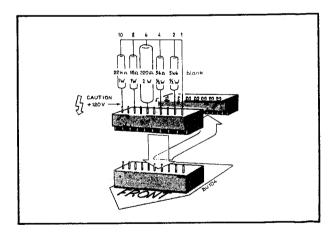
- Connect a voltmeter to BU 107 pin  $+5.2\,V$  and check that the voltage is 4.8—5.2 V. If the measured voltage does not reach 4.8—5.2 V unsolder R 1103 and select a resistor value that gives the desired voltage. The value of this resistor may be 1 k $\Omega$  to 33 k $\Omega$ . Typical value is 8 k $\Omega$ .
- Check the d.c. voltages.

#### D.C. voltages

 Connect the voltmeter to jumper connector BU 104 and check the d.c. voltages according to table below.

Test point	Measured voltage
+120	115 130 V
+5.2	4.8 5.2 V
+12	11.5 13 V
<b>—</b> 5.2	55.4 V
<del></del> 50	5060 ∨

#### **Dummy load**



A fault in the power supply can be isolated easer if the counter circuits are disconnected by removing 10-pins connector BU 107. However, to simulate the load, a dummy load has to be fitted as shown in the figure. The dummy load can be assembled of the following components:

1 female connector 10 pins	5322 267 <b>\$4 1</b> 02
1 carbon resistor 22 $\Omega$ , 1 W	4822 110 23 <b>1</b> 43
1 carbon resistor 220 $\Omega$ , 1 W	4822 110 23 🗷 89
1 carbon resistor, $18\Omega$ , $2W$	4822 110 100061
1 carbon resistor, $56\Omega$ , $0.5W$	4822 110 \$3074
1 carbon resistor, 5.6 kΩ, 0.5 W	4822 110 \$3 1 27

CAUTION: + 120 V at pin 10 of the connector!

#### **Power Supply**

#### Troubleshooting the power supply

Crowbar circuit. The purpose of this circuit is to blow fuse VL 150 when the  $+5\,\text{V}$  voltage becomes  $\approx +6\,\text{V}.$  If the fuse blows when the counter is switched on or off check TS 150. A simple way to check the performance of this circuit is to connect a dc source set to 1 A and 15 V to the external battery sockets at the rear panel of the counter and remove printed board BU 107. If the current limit lamp then turns on, indicating that TS 150 is conducting, the crowbar circuit is working properly.

Voltage regulator. The purpose of this circuits is to regulate the d.c. output levels by turning on TS 154 and stop the oscillating.

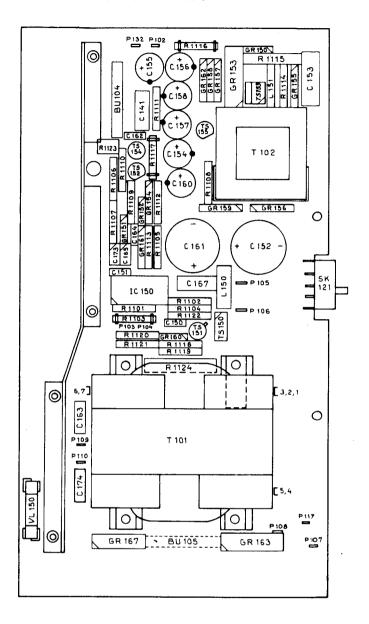
If the blocking oscillator does not oscillate check the voltage regulator by removing TS 154, if the blocking oscillator then starts to oscillate the fault may be caused by the voltage regulator.

**D.c. to d.c. converter.** This circuit is basically a blocking oscillator which is started by TS 155 and switched off by TS 154. If it is not oscillating check the voltage regulator and the base voltages at TS 152 ( $\approx$  0.7 V) and TS 153 ( $\approx$  1.4 V).

Switch off transistor TS 154. The purpose of this transistor is to switch off the blocking oscillator when the sum of the sawtooth voltage from the emitter of TS 153 and the dc voltage from terminal 10 of IC 150 becomes  $\approx 0.5 \text{ V}$  and turns on TS 154.

Current generator TS 155. The purpose of this transistor is to start the blocking oscillator by a bias current of  $\approx$ 1 mA through base/emitter of TS 152 and TS 153. A voltage drop of  $\approx$ 1 V across R1108 indicates that this circuit works properly.

#### Component layout power supply



### Input amplifiers

#### General

The input amplifiers are identically, input B is, however, functionally limited to 10 MHz. In common mode the input circuits of amplifier A are disconnected and the signal is fed from input B via the separate/ common switch to amplifier A.

The signal is analogue from the input socket to amplifier IC 101 and when measuring these circuits the oscilloscope should be earthed via the earth-pin at C 102 or C 112. From IC 101 to C 103 the signal has ECL levels. The output from TS 103:C and TS 104:C is a TTL signal. When measuring the ECL and TTL signals the oscilloscope should be earthed via the earth-pin at IC 102:1.

#### Adjustment

#### D.C. balance amplifier A

- Disconnect all input signals, release all push-buttons and set the controls of the counter:

Start/Stop

upper position

Trigg. level pot.

pulled

- Connect the voltmeter between IC 101:6 and ground and adjust R1104 until voltmeter shows 0 V ±2 mV.

#### D.C. balance amplifier B

- Disconnect all input signals, release all push-buttons and set the controls of the counter:

Start/Stop

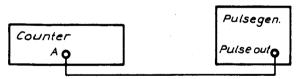
upper position

Trigg.level pot.

pulled.

- Connect the voltmeter between IC 101:12 and ground and adjust R1104 until voltmeter shows 0 V

#### Frequency compensation amplifier A



— Set the controls of the counter:

Attenuator

200 mV position

— Set the controls of the pulse generator:

Frequency Amplitude

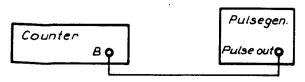
10 kHz

1 V

Duty factor 0.5

 Connect the oscilloscope via a well adjusted 10 M  $\Omega/11$  pF probe to terminal 6 of IC 101 and adjust C 102 to minimum distortion of the displayed waveform.

#### Frequency compensation amplifier B



— Set the controls of the counter:

**Attenuator** 

200 mV position

- Set the controls of the pulse generator:

Frequency 10 kHz Amplitude 1 V **Duty factor** 0.5

- Connect the oscilloscope via a well adjusted 10 M $\Omega$ /11 pF probe to terminal 12 of IC 101 and adjust C 112 to minimum distortion of the displayed wave form.

#### Functional check

#### Preliminary setting of the controls

- All push-buttons in released position.
- Display time potentiometer in power on position and minimum display time.
- Trigger level potentiometers in pulled position.
- Hold off in position off.
- Internal/external slide switch in position internal.

#### Control circuits for prescaler and check modes

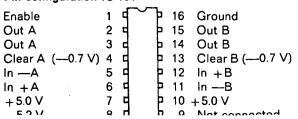
Truth table for channel A

	Check mode	Prescaler mode
SK 120 pin 1 pin 3 pin 4 pin 6	Floating Ground High TTL Ground	Ground Ground
IC 101 pin 1 pin 2 pin 3	Floating Low ECL Low ECL	Ground Don't care Don't care
IC 152 pin 1 pin 2 pin 3	High TTL 10 MHz 10 MHz	Ground 10 MHz High TTL
SK 108 pin 2 pin 5	High ECL 10 MHz ECL swing	High ECL High ECL
IC 103 pin 5	Low ECL	Prescaler signal, ECL swing
pin 6 IC 155:13	10 MHz ECL swing Low TTL	Low ECL High TTL

#### Amplifier and Schmitt-trigger IC 101

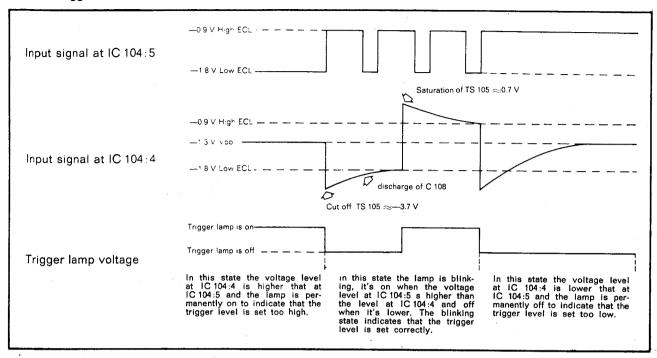
IC 101 is an amplifier and Schmitt trigger with analogue input and ECL output.

#### Pin configuration IC 101



### Input amplifiers

#### Tri state trigger indicator



#### Truth table IC 101

Ampl. A Pin 5 and 6		Ampl. A and E 12 Pin 2 and 14		
6>5		Н	Н	Gnd
6<5		L ·	Н	Gnd
-	12>11	Н	L	Gnd
	12<11	L	Н	Gnd
Don't care	Don't care	= —2.2 V	22.	.2 V

$$H = -0.8 \text{ V}$$
  $L = -1.8 \text{ V}$ 

#### ECL/TTL converter

The input signal to IC 103 from the gate circuits has ECL levels. The A1 and A2 signals has TTL levels. The emitter signals of TS 103 and TS 104 has a voltage swing of approximately —0.8 V to —1.3 V.

#### Prescaler level detector

The prescaler level detector will feed the signal from the prescaler unit at IC 104:10 to the ECL/TTL converter when voltage level at IC 104:9 is Vbb (—1.3 V). When the prescaler unit is not used the voltage level at IC 104:9 is low ECL.

#### Trigger level controls

- Do the preliminary setting of the counter.
- Depress trigger level controls and set them to fully CCW position.
- Check that the voltage at the monitor sockets are
   2.7 ±0.2 V and that the trigger indicator lamps are off.
- Set the trigger level controls to CW position.
- Check that the voltage at the monitor sockets are  $+2.7 \pm 0.2$  V and that the trigger indicator lamps are on.

#### Slope controls

- Do the preliminary setting of the controls.
- Set the function selector to time interval A to B
   0.1 ns and set the separate/common selector to common position.
- Connect a pulse generator to input B and set repetition time to 100 ms, duration to 30 ms and the amplitude to 1 V.
- Set the slope controls and check the display readout according to table below.

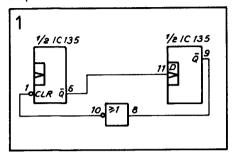
Slo A	pe setting and B	Display read-out	Unit
pos.	neg.	00000030.0	ms
pos.	pos.	00000100.0	ms
neg.	pos.	0000070.0	ms
neg.	neg.	00000100.0	ms

#### ac/dc coupling

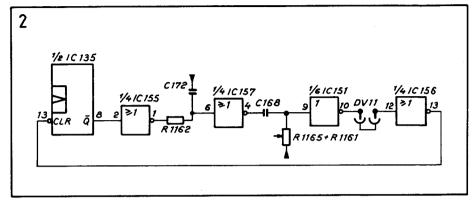
- Do the preliminary setting of the controls.
- Connect a square wave pulse with a frequency of 1 MHz, an amplitude of + 2 V and a dc level of + 2.5 V to the counter's A input.
- Set the function selector to Frequency A 1 Hz, the attenuator to 200 mV and the ac/dc selector to ac position.
- Check that display read out is 1000 kHz.
- Set ac/dc selector to dc position and check that display read out is zero.
- Set the function selectors to period 5 0.1 μs, the attenuator to 200 mV and the ac/dc selector to ac position.
- Check that display read out is 0.0010 ms.
- Set ac/dc selector to dc position and reset the counter.
- Check that display read out is zero.

#### Main Gate and Display Time Circuits

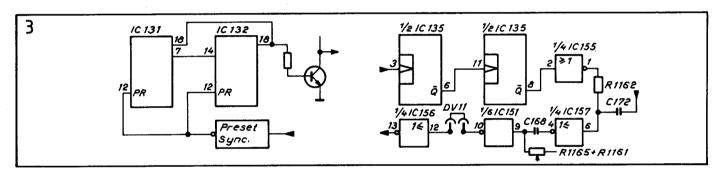
The three Reset Loops below are presented in the same order as they are closed during a Main Gate and Display time sequence.



This Reset Loop makes a Low Clear in the Main Gate flip flop in the beginning of the Display Time. See time  $t_2$  in the timing diagram.



This Reset Loop makes a Low Clear in the Display flip flop when Reset arrives. See time t<sub>3</sub> in the timing diagram.



This Reset Loop makes a Low Preset in the Time Base Divider IC 131 and IC132.

#### Trouble shooting the Reset Loops

A fault in the Reset Loops can give fault symptoms in the Time Base, Main Gate and Display Time circuits. To isolate a fault in the Reset Loops use the following procedure.

— **Set the controls** of the counter. Function Selectors: Single Period B

0.1 ms

Slope: positive Attenuator: 20 mV Coupling: dc Trigger Level: ~0.5 V

Display Time: around mid position

Hold Off: off

- Connect Sync Out from a pulse generator set to Single Shot mode to Input B of the counter.
- Reset the counter and measure the logic levels as shown in the Reset truth table. See time t<sub>1</sub> in the timing diagram.

**Push Single Shot once** and measure the logic levels as shown in the First Single Shot truth table.

See the time interval  $t_1$  to  $t_2$  in the timing diagram.

												Reset
Terminal												
Level	:1	:2	:3	: 4	: 5	:6	: 8	: 9	:10	: 11	:12	:13
IC 135	Н	Н		Н	L	Н	Н	L	Н	Н	Н	н
IC 151								Η	L			
IC 154				Н	L	Н						
IC 155	L	Н	L	L	Н	L						
IC 156	L	Н	Н	Н	L	L	L	L	Н	L	L	н
IC 157				Н	L	L	Н	Н	L	Н	L	L
IC 158	L	L	Н	Н	Н	L				L	H	н

First Single Shot

Terminal												
Level	:1	: 2	:3	: 4	: 5	: 6	: 8	: 9	:10	:11	:12	:13
IC 135	Н	L		Н	Н	L	Н	L	Н	L	Н	Н
IC 151								Н	L			
IC 154				Н	Н	L						
IC 155	L	Н	L	L	Н	L						
IC 156	L	Н	Н	Н	L	L	L	L	Н	L	Ĺ	Н
IC 157				Н	L	L	L	L	Н	L	Į	Н
IC 158	L	L	Н	Н	Н	L				L	H _	Н

Push Single Shot a second time and measure the logic levels as shown in the Second Single Shot truth table immediately after the single shot is given. See time interval  $t_2$  to  $t_3$  in the timing diagram. This, and the following truth table, might be somewhat difficult to measure because of the influence from the RC network R1156//C173, R1159//C172 and the display time R1157 + R1158//C171.

										,00114	Oning	ie Oliot
Terminal Level	: 1	: 2	: 3	: 4	: 5	÷6	:8	:9	:10	:11	:12	:13
IC 135	L	Н		Н	L	Н	L	Н	Н	Н	L	Н
IC 151								Н	L			
IC 154				Н	L	Н						
IC 155	Н	L	L	L	Н	Н						
IC 156	L	Н	Н	J	$\gamma$	L	Н	L	L	L	L	Н
IC 157				Н	Н	L	Н	Н	Ĺ	Н	L	L
IC 158	L	L	Н	J	Н	Л				L	Н	Н

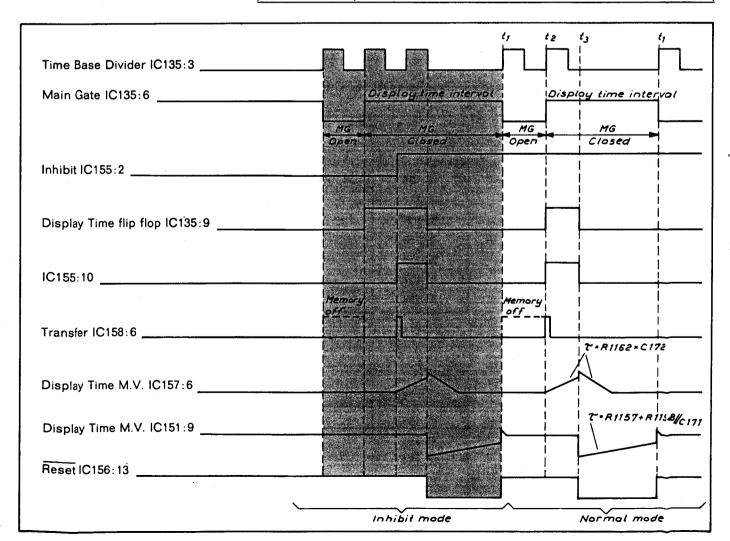
Second Single Shot

ta to ta

The last truth table shows the logic levels in the time interval  $t_3$  to  $t_1$  in the timing diagram.

After the display time is out the logic levels will return to what is shown in the first truth table (Reset).

												•
Terminal												
Level	:1	:2	:3	: 4	:5	: 6	:8	: 9	:10	:11	:12	:13 ·
IC 135	L	Н		Н	L	Н	Н	L	Н	Н	Н	L
IC 151							٠.	L	Н			
IC 154				Н	L	Н						
IC 155	Ĺ	Н	L	L	Н	L						
IC 156	Н	L	L	Н	L	L	L	Н	L	L	Н	L
IC 157				L	Н	Н	Н	Н	L	Н	L	Ĺ
IC 158	L	L	Н	Н	Н	L				· L	Η	Н



### Ouad Decade IC 132...133 and IC 177...178

The Quad Decade contains four separate decades and a flip-flop, in this application the flip-flop is not used. The Preset Input is a common input for the decades, a High level applied to this input will preset all decades to 19999.

The Reset Input is also a common input and a High level applied to this input will reset all decades to

The Count Input is an exclusive input for the first decade, the signal to be counted is applied to this input. Each decade has a Carry Output which is connected to the Carry Input of the following decade.

All carry signals except from the first decade are available for measurement, in this application only Carry 10 000 is used.

The carry signal is active Low and its pulse width is equal to the repetition time of the signal at the Count Input.

Each decade has also a BCD output and a Latch.

The latch is a memory where the BCD information from the decades are stored.

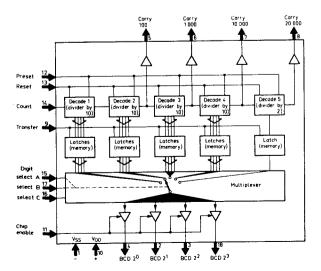
The Transfer Input is a common input for the decades, a High Level applied to this input will open all latches and feed the BCD information stored in the latches to the multiplexer.

The Multiplexer is a programmable selector, the signals applied at the digit select inputs determines which latch the multiplexer will select, in this application input C is not used.

The BCD output is a tri state output, it can be logic 1, logic 0 or high-ohmic.

A High Level at Chip Enable Input will allow the multiplexer pass the BCD information in the preselected latch to the BCD output, a Low level makes the output high-ohmic.

Input A	Input B	Decade selection
L H	L L	Decade 1 Decade 2 Decade 3
Н	H	Decade 4



See also the Timing Diagram in the Main Gate and Display Time description.

#### First Decade

The First Decade is working up to 80 MHz and is designed with discrete integrated circuits.

It contains a divider by 10 IC 174, a memory IC 175 and a gate output with open collector IC 176.

#### Decimal point setting

The Decimal Point Signals are fed from output 1 to 6 of the Address Decoder via the Decimal Point Switch to input 6 of the 7 Segment Decoder. A table in Logic Circuits diagram shows which settings of the Function Selector will interconnect which pins of the Decimal Point Switch and thereby connect one of the decimal point outputs from the Address Decoder to the decimal point input of the 7 Segment Decoder.

#### Gate Lamp Multivibrator

This circuit extends the fastest main gate signal and makes it suitable for driving the gate lamp. The input to this circuit is the main gate signal at IC 157:3 and the output is the signal to the gate lamp at BU 101:7.

#### **Blanking Pulse Generator**

This circuits turns off the display between the presentation of each digit to prevent streamers between adjacent digits.

The input to this circuits is the display clock signal at R1176 and the output is the blanking signal to the emitters of TS 180...188 and IC 181:1.

Positive going pulse from the display clock will turn off TS 177 and thereby the cathode and anode voltages to the display. Test points 6 and 7 show the display clock signal and the blanking signal.

#### **Display**

The display is a 9 digits gas discharge display, each digit has 7 segments and a decimal point.

Each one of the digits are connected to a driving transistor which is connected to an output of the Address Decoder.

A low input from the Address Decoder turns on the transistor and its digit, this is shown in oscillogram number 8 in the logic circuit diagram.

In one scanning cycle the outputs go from High to low in the order 10:1:2:3:4:5:6:7:9, output number 10 is connected to the least significant digit and output number 9 is connected to the most significant digit. Only one digit will be presented at a time and beto re the next digit is presented a blanking pulse turns off the display. The blanking pulse is shown in oscillogam number 7 in the logic circuit diagram.

#### **Display Clock and Address Counter**

The Display Clock is an oscillator with a frequency of aproximately 5 kHz. Test point 6 shows the out ut from the Display Clock to the Blanking Pulse Geregrator.

The Address Counter is a 1 of 10 to BCD conveter and it is converting the Display Clock signal from IC 151:12 to Address Signals in BCD form.

#### **Decades and 7 Segment Decoder**

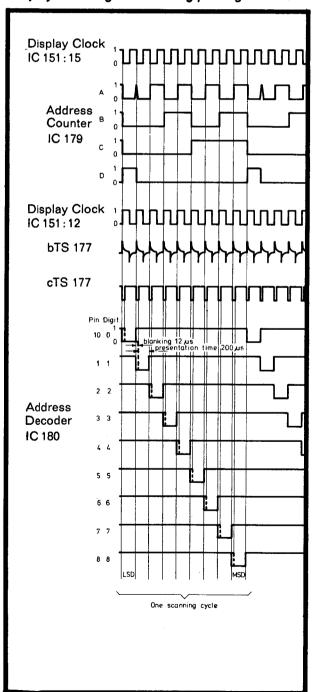
The adress from the Address Counter selects which of the decades IC 176, IC 177 or IC 178 that will be presented on the display.

D bit from the Address Decoder selects the first decade, C and D bits select the first Quad Decade (2 to 5 decade) and the C bit selects the second Quad Decade (6 to 9 decade).

The A and B bits from the Address Decoder select which of the four decades in the quad decade that will be selected.

The outputs from the three decades are connected via a bus line to the 7 Segment Decoder.

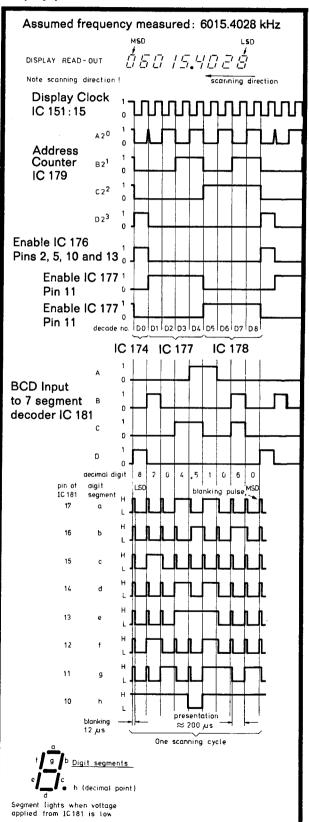
#### Display scanning and blanking pulse generation



#### **Hold Off Circuits**

The Hold Off Circuits extend the closing time of the Main Gate to prevent unwanted stop signals to end the measurement.

#### Display presentation



Ordering no	Ω	%	Туре	Item	Ordering no	Ω	%	Туре	Item
4822 110 63214	10M	10	CR25	R1003	4822 110 63098	470	5	CR25	R1134
4822 110 63189	1.24	10	CR 25	R1004	4822 110 63098	470	5	CR25	R1135
4822 110 63189	1.24	10	CR25	R1005	4822 110 63098	470	5	CR25	R1136
4822 110 63154	56	5	CR25 PR37	R1006	4822 110 63098	470	5	CR25	R1137
5322 116 54984 4822 110 63165	68 150K	5 5	CR25	R1007 R1008	4822 110 63152 4822 110 63125	47K	5	CR25	R1138
4822 110 63134	10K	5	CR 25	R1009	4822 110 63107	4.7K 1.0	5 5	CR25 CR25	R1139 R1140
4822 110 63134	10K	5	CR25	R1010	4822 110 63107	1.0	ś	CR25	R1141
4822 110 63081	100	5	CR25	R1011	4822 110 63134	10K	5	CR25	R1142
4822 110 60006	390	5	CR25	R1012	4822 110 63152	47K	5	CR25	R1143
4822 110 63094	330	5	CR25	R1013	4822 110 63152	47K	5	CR25	R1144
4822 110 63116 4822 110 63092	2.2K	5 5	CR25 CR25	R1017 R1018	4822 110 63152	47K	5	CR 25	R1145
4822 110 63092	270 180	5	CR25	R1019	4822 110 63152 4822 110 63134	47K 10K	5 5	CR25	R1146
4822 110 63107	1.0K	5	CR25	R1020	4822 110 63107	1.0	5	CR25	R1147 R1150
4822 110 63098	470	5	CR25	R1021	4822 110 63107	1.0	5	CR 25	R1151
4822 110 63098	470	5	CR25	R1022	4822 110 60006	390	5	CR25	R1152
4822 110 63134	10K	5	CR25	R1023	4822 110 63214	10M	10	CR25	R1153
4822 110 63109 4822 110 63089	1.2K 220	5 5	CR25 CR25	R1024 R1025	4822 110 63143 4822 110 63123	22K	5	CR 25	R1 154
4822 110 63132	8.2K	5	CR25	R1026	4822 110 63107	3,9K 1.0	5 5	CR25 CR25	R1156 R1157
4822 110 63098	470	5	CR25	R1028	4822 110 63089	220	5	CR25	R1158
4822 110 63098	470	5	CR25	R1029	4822 110 63134	10K	5	CR25	R1160
4822 110 63121	3.3K	5	CR25	R1030	4822 110 63134	10K	5	CR25	R1161
4822 110 63214	104	10	CR 25 CR 25	R1033	4822 110 63187	] M	5	CR 25	R1162
4822 110 63189 4822 110 63189	1.2M 1.2M	10 10	CR25	R1034 R1035	4822 110 63134 4822 110 63107	10K 1.0	5 5	CR25 CR25	R1163
4822 110 63154	56	5	CR25	R1036	4822 110 63125	4.7K	Ś	CR25	R1164 R1166
5322 116 54984	68	5	PR37	R1037	4822 110 63114	1.8K	5	CR25	R1167
4822 110 63165	150K	5	CR25	R1038	4822 110 63114	1.8K	5	CR25	R1168
4822 110 63134	10K	5	CR 25	R1039	4822 110 63185	820K	5	CR 25	R1170
4822 110 63134 4822 110 63081	10K 100	5 5	CR25 CR25	R1040 R1041	4822 110 63098	470	5	CR25	R1171
4822 110 60006	390	5	CR25	R1042	4822 110 63098 4822 110 63114	470 1.8K	5	CR25 CR25	R1172 R1173
4822 110 63094	330	5	CR25	R1043	4822 110 63114	1.8K	5	CR25	R1174
4822 110 63116	2 • 2K	5	CR25	R1047	4822 110 63116	2.2K	5	CR25	RI 175
4822 110 63092	270	5	CR25	R1048	4822 110 63125	4.7K	5	CR 25	R1176
4822 110 63087 4822 110 63105	180 820	5 5	CR25 CR25	R1049	4822 110 63143	22K	5	CR25	R1177
4822 110 63098	470	5	CR25	R1050 R1051	4822 110 63129 4822 110 63138	6.8K	5 5	CR25	R1178
4822 110 63098	470	5	CR25	R1052	4822 110 63138	15K 15K	5	CR25	R1180 R1181
4822 110 63134	10K	5	CR25	R1053	4822 110 63138	15K	5	CR25	RI 182
4822 110 63134	10K	5	CR 25	R1054	4822 110 63138	15K	5	CR25	R1183
4822 110 63089 4822 110 63098	220 470	5 5	CR25 CR25	R1055 R1058	4822 110 63138	15K	5	CR25	R1 184
4822 110 63098	470	ś	CR25	R1059	4822 110 63138 4822 110 63138	15K 15K	5 5	CR25 CR25	R  185 R  186
4822 110 63121	3.3K	5	CR25	R1060	4822 110 63138	15K	ś	CR25	RI 187
5322 116 50524	3.01K	1	MR 25	R1101	4822 110 63138	15K	5	CR25	R1 188
5322 116 54011	5.62K	1 **	MR25	R1102	4822 110 63098	470	5	CR25	R1 189
4822 110 63107	SELECT	5	CR25 CR25	R1103 R1104	4822 110 63116	2.2K	5	CR25	R1 190
4822 110 63121	1.0K 3.3K	5	CR25	R1104	4822 110 63116 4822 110 63116	2 • 2K	5	CR25	R1 191
4822 110 63107	1.0K	5	CR25	R1106	4822 110 63116	2.2K 2.2K	5 5	CR25 CR25	R1 192 R1 193
4822 11D 63107	1 K 1.2K	_		R1107	4822 110 63116	2.2K	5	CR25	R1 194
4822 110 63109		5 5	CR25 CR25	R1108 R1109	4822 110 63116	2.2K	5	CR25	RI 195
4822 110 63116 4822 110 63169	2•2K 220K	5	CR25	R1110	4822 110 63116	2 • 2K	5	CR25	R  196
4822 110 63089	220	5	CR25	R1111	4822 110 63116	2.2K	5	CR25	RI 197
4822 110 63063	22	5	CR25	R1112					
4822 110 63089	220	5	CR25	R1113	Ordering no	$\Omega$	Descript	ion	lte m
4822 110 63032 5322 116 54963	1.5 0.18	5 10	CR 25	R1114 R1115	5322 101 14011	100	TRIMM	POTM	RIO14
4822 110 63098	470	5	CR25	R1116	5322 101 64017	47K	SK109	. 51	R1015
4822 110 63089	220	5	CR25	R1117	5322 101 14011	100	TRIMM	POTM	R1044
4822 110 63072	47	5	CR25	R1118	5322 101 64017	47K	SK119	CV	RIO45
4822 110 63169	220	5 5	CR25 CR25	R1119 R1120	5322 101 94007	1 M	\$K101	2×105	R13.65
4822 110 63107 4822 110 63081	1.0K 100	5	CR25	R1121	Ordering no	c	07	V	ls
4822 110 63081	100	5	CR 25	R1122	Ordering no	F	%	<u> </u>	lte m
4822 116 30114	4.7K	NTC	NTC	R1123	4822 121 40407	22N	10	630	C101
4822 113 60084	1.0	10	CR25	R1124	4822 122 31076	68P	2	100	C 103
4822 110 63134 4822 110 63107	10K 1.0	5 5	CR25	R1127 R1128	4822 122 31168 4822 122 31072	270P 47P	2	500	C104 C105
4822 110 63107	1.0	ś	CR25	R1129	5322 122 34041	10N	-20+50	100	C 106
4822 110 63107	1.0	5	CR25	R1130	5322 121 40323	100N	10	100	C 107
4822 110 63163	120K	5	CR 25	R1131	5322 124 14053	33M	-10+50	10	C108
4822 110 63152 4822 110 63089	47K 220	5 5	CR25	R1132	4822 121 40407 4822 122 31076	22N	10	630	CILI
- FE 110 03007	220	,	CR25	R1133	405F 15E 31010	68P	2	100	C12 3

## Basic board

Ordering no	F	%	V	Item	Ordering no	Description	Item
4822 122 31168	270P	2	500	C114	5322 130 24035	BT1004=02	T\$150
4822 122 31072	47P	2	100	C115	5322 130 40482	BRY39	TS151
5322 122 34041	10N	-20+50	100	C116	4822 130 40855	BC337	TS152
5322 121 40323	100N	10	100	C117	5322 130 44417	BDX35	TS153
5322 124 14053	33M	-10+50	-	C118	5322 130 40482	BRY39	TS154
4822 122 31081	100P	2	100	C119	5322 130 44418	BF256A	TS155
5322 124 14053	33M	-10+50		C121	4822 130 40937	BC548B	T\$156
5322 122 34041 5322 124 14053	10N	=20+50		C122 C123	5322 130 44256	BC557	T\$177,
5322 122 34041	33M 10N	-10+50 -20+50	-	C124	5322 130 44247	B\$\$68	T\$180
5322 122 34041	10N	-20+50		C125	5322 130 44247	B\$\$68	TS181
5322 122 34041	10N	-20+50		C126	5322 130 44247	B\$\$68 B\$\$68	TS182 TS183
5322 122 34041	ION	-20+50	-	C127	5322 130 44247 5322 130 44247	85568	TS184
5322 122 34041	10N	-20+50	100	C128	5322 130 44247	85568	TS185
5322 122 34041	100	-20+50		C129	5322 130 44247	B5568	TS186
4822 121 40407	22N	10	630	C130	5322 130 44247	B\$\$68	T\$187
4822 122 31036	2 • 2P	2	100	C131	5322 130 44247	BSS68	T5188
5322 122 34041 5322 124 14053	10N 33M	-20+50 -10+50		C132 C133	5322 209 85408	MC1651L	10101
5322 124 14053	33M	-10+50		C133	5322 209 84643	MC10102P	10102
5322 122 34041	100	<b>-20+50</b>		C136	5322 209 85409	GXB10110	10103
5322 122 34041	10N	-20+50		C137	5322 209 84825 5322 209 84183	MC10216P	10104
4822 124 10197	47M	-10+50	_	C139	5322 209 84183	SN74S74N SN74S74N	10125 10126
4822 124 10197	47M	-10+50	6.3	C140	5322 209 84304	5N75107AN	10127
4822 121 40232	220N	10	100	C141	5322 209 85406	N74LS54A	10128
5322 122 34041	10N	-20+50	100	C144	5322 209 84628	N7403A	10129
4822 122 30113	180P	2	100	C146	5322 209 84528	SN7400N	10130
5322 122 34041	100	-20+50		C147	5322 209 84722	GZF1201P MOS	1C131
5322 122 34041	10N	<b>~20+50</b>	100	C150	5322 209 84722	GZF1201P MOS	10132
4822 122 31081	100P	-10.50	4.0	C151	5322 209 85001 5322 209 84996	SN74LS157N	10133
4822 124 20534 4822 121 40104	680M 150N	+10+50 10	250	C152 C153	5322 209 84183	SN74LS10N SN74LS74N	10134 10135
4822 124 20586	150M	-10+50		C154	5322 209 84724	SN74564N	10136
4822 124 20589	220M	-10+50		C155	5322 209 85407	N74502A	10137
4822 124 20589	220M	-10+50	_	C156	5322 209 84655	723PC	10150
4822 124 20589	220M	-10+50	10	C157	5322 209 85085	F34049PC SELECTED	10151
4822 124 20499	22M	-10+50		C160	5322 209 84983	SN74LSOON	10152
4822 124 20534	680M	=10+50		C161	5322 209 85412 5322 209 84983	CD4093BE MOS	10153
5322 122 34041 5322 124 24116	10N	-20+50	100	C162 C163	5322 209 84993	SN74LSOON SN74LSO2N	10154 10155
4822 122 31165	1 M 330P	10	100	C164	5322 209 84993	SN74LSO2N	10156
5322 124 14075	1 M	-10+50		C165	5322 209 84976	ICF4001PC	10157
5322 122 34041	ION	-20+50		C166	5322 209 84983	SN74LSOON	10158
4822 121 40232	220N	10	100	C167	5322 209 84984	SN74LSO4N	10159
5322 124 14066	10M	-10+50		C168	5322 209 85411	745196	10174
5322 122 34041	10N	-20+50		C169	5322 209 80059 5322 209 84529	74LS75	10175
4822 122 31081 5322 121 40323	100P 100N	2	100 100	C170 C172	5322 209 84722	SN7403N GZF1201P MOS	10176
5322 121 40323	100N	10 10	100	C176	5322 209 84722	GZF1201P MOS	10177 10178
4822 122 30114	2.2N	10	100	C178	5322 209 80072	SN7490AN	10179
5322 122 34041	10N	-20+50		C179	5322 209 80142	SN7442AN	10180
4822 121 41156	68N	10	250	C180	5322 209 84723	DM8884AN	10181
5322 121 44137	68N	10	250	C181	5322 111 94015	6X1.0K	10190
5322 121 44137	68N	10	250	C182	5322 111 94015	6X1.0K	10191
5322 121 44137	68N	10	250 250	C183 C184	5322 111 94031 5322 111 94031	6X47K	10192
5322 121 44137 5322 121 44137	68N 68N	10 10	250	C185	5322 111 94012	6X47K 6X6.8K	10193 10194
5322 121 44137	68N	10	250	C186	5322 111 94012	6X6.8K	10195
5322 121 44137	68N	10	250	C187	5322 111 94031	6X47K	10196
5322 121 44137	68N	10	250	C188	5322 111 94012	6X6.8K	10197
4822 121 40104	150N	10	250	Ç189	5322 111 94026	6X470K	10198
					4822 130 30509	BZY88+C4V3	GRI 01
Ordering no	F	,	V	ltem	5322 130 30613	BAW62	GRI 02
			•	<del>- 10111</del>	5322 130 30613	BAW62	GR1 03
5322 125 54024	2-9P		300	C102	4822 130 30509	BZY88-C4V3	GR1 04
5322 125 54024	2-9P		300	C112	5322 130 34563	BZX79-C2V7	GR1 05
					5322 130 30613 5322 130 34563	BAW62 BZX79-C2V7	GR1 06
Ordering no	Descrip	otion		Item	5322 130 30613	BAW62	GR1 07 GR1 08
5322 130 44578	E411 S	ILICONI)	₹	T5101	4822 <b>130 30</b> 509	BZY88-C4V3	GRI 11
5322 130 44578		ILICONI		TS102	5322 130 30613	BAW62	GR112
5322 130 44435	245770			TS103	5322 130 30613	BAW62	GR1 13
5322 130 44435	245770			T\$104	4822 130 30509	BZY 88-C4V3	GR1 14
5322 130 44215	MPSL08			TS105	5322 130 34563	BZX79-C2V7	GR1 15
5322 130 44215 5322 130 40407	MPS LO8 2N2369			TS106 TS142	5322 130 30613 5322 130 34563	BAW62 BZX79-C2V7	GR116 GR117
4822 130 40855	BC337			TS146	5322 130 30613	BAW62	GR   18
14- 14-27	551					· · · · · <del>-</del>	

## **Basic board**

Ordering no	Description	Item	Ordering no	Description	Item
5322 130 30613 5322 130 34047 5322 130 30613 5322 130 30613	BAW62 BZX75=CIV4 BAW62 BAW62 BAW62 BAW62 BAW62 BAW62 BAW62 BAW62 BAW62 BAW62 BAW62	GR121 GR122 GR125 GR138 GR139 GR140 GR141 GR142 GR142 GR142 GR145 GR145	4822 252 20001 5322 131 94042 5322 462 34127 5322 158 10289 5322 158 10289 5322 158 10243 5322 158 10284 5322 158 10284 5322 158 10284 5322 158 10052 4822 526 10097 5322 158 10052	THERMAL FUSE DISPLAY GUIDE RAIL INDUCTANCE 0.68MH INDUCTANCE 100MH INDUCTANCE 47MH INDUCTANCE 47MH CHOKE FXC BEAD CHOKE	VL101 B101 FOR U1 L101 L102 L103 L104 L105 L150 L151 L152
5322 130 30594 5322 130 30774 5322 130 30594 5322 130 34401 5322 130 30392 4822 130 30868 4822 130 30868 4822 130 30868	BZX79-C10 BAV10 BZX70-C56 BZY88-C3V3 BY207 BY206 BY210-400 BY210-400	GR151 GR152 GR153 GR154 GR155 GR156 GR157 GR158	Ordering no  5322 456 14054 5322 456 14055 5322 456 14056 5322 450 64059 5322 414 34076	Description  TEXT PLATE TEXT PLATE TEXT PLATE WINDOW FUNCTION KNOB	PM6622 PM6624 PM6625 SK105
4822 130 30839 5322 130 34167 4822 130 30868 5322 130 30414 5322 130 30613 5322 130 30613 5322 130 30613 5322 130 30613	8Y206 BZX79=B6V2 BY210-400 BY126 BY164 BAW62 BZX75=C2V1 BAW62 BAW62 BAW62	GR159 GR160 GR161 GR163 GR167 GR170 GR171 GR172 GR173	5322 414 74019 5322 414 74015 5322 414 74015	COVER FUNCTION KNODISPLAY KNOB COVER DISPLAY KNOB HOLD OFF KNOB COVER HOLD OFF KNOTTRIGGER KNOBS COVER TRIGGER KNODISPUSH BUTTON KNOBS INPUT SOCKETS A B	DB SK105 SK101 B SK101 SK403 DB SK403
5322 130 30613 5322 130 34189 5322 130 34189	BAW62 BAW20 BAW20	GR175 GR180 GR181	Ordering no	Description	ltem.
5322 130 34189 5322 130 34166	BAW20 BAW20 BAW20 BAW20 BAW20 BAW20 BAW20 BZX79-C51	GR182 GR183 GR184 GR185 GR186 GR187 GR188 GP189	5322 267 34059 5322 267 34059 5322 265 30066 5322 267 10004 5322 267 10004 5322 267 10004 5322 277 24017	EXT BATTERY SOCKET EXT BATTERY SOCKET MAINS INPUT SOCKET INPUT D-10MHZ OUT EXT. RESET GATE OPEN INT EXT STD SWITCH	BU21 BU22 BU23 BU24 BU25 BU27 SK22
Ordering no	Description	Item	Ordering no	Description	Qty
5322 256 34031 5322 255 44107 5322 255 44112 5322 255 40089 5322 255 4006 5322 265 54006 5322 265 54018 5322 265 44064 5322 265 44064 5322 265 44064	FUSEHOLDER 1C HOLDER 16 PINS 1C HOLDER 18 PINS TRANSISTOR HOLDER TRANSISTOR HOLDER TRANSISTOR HOLDER FEMALE CONNECTOR MALE CONNECTOR MALE CONNECTOR MALE CONNECTOR MALE CONNECTOR MALE CONNECTOR FEMALE CONNECTOR	VL150 D.I.L TO 18-3 TO 18-4 TS153 BU 102 BU 102 BU103 BU104 BU105 BU105	5322 498 54048 5322 498 54054 5322 520 34164 5322 414 64053 5322 447 84467 5322 467 84466 5322 466 85335 5322 459 24054 5322 462 44181 5322 462 44179 4822 462 70497	HANDLE ARM HANDLE PROFILE BEARING BUSH CAP HANDLE ARM TOP COVER BOTJON COVER FRONT ORNAMENT REAR ORNAMENT REAP FOOT BOTTON FOOT PLUG BOTTOM FOOT	2 1 2 2 1 1 1 1 4 4 4 4 4
5322 255 44107 5322 265 54006 5322 101 94007 5322 276 14117 5322 276 14117 5322 273 74008 5322 276 14117 5322 276 14117	FEMALE CONNECTOR COMBINED SWITCH COMBINED SWITCH PUSH BUTTON SWITCH SWITCH PUSH BUTTON SWITCH SLIDE SWITCH MAINS TRANSFORMER PUSE 1.6A FAST	BU107 SK101 SK102 SK103 SK104 SK106 SK106 SK107 SK108 SK109 SK110 SK116 SK117 SK118 SK117 SK118 SK117 SK118 SK117 SK118 SK117 SK118 SK117	Ordering no  5322 321 24389  5322 268 24073  5322 268 24073  5322 130 34562  5322 130 34562  5322 130 34562  5322 130 34562  5322 130 34562  Ordering no  5322 321 24391  5322 277 24006  5322 101 54008  5322 121 54118	TEST SOCKET TEST SOCKET LD35/II LD35/II LD35/II LD35/II LD35/II LD35/II	

### Prescaler PM 6624

Ordering no	Ω	%	Туре	ltem	Ordering	no	F	%	V	Item
4822 116 51142	150	5	PR37	R201	4822 12	2 31177	470P	10	100	C201
5322 116 54396	68	5	PR52	R202	4822 12		470P	10	100	C202
5322 116 54396	68	5	PR52	R203	4822 12.		470P	10	100	C203
5322 116 50417	162	5	MR 25	R204	4822 12	2 31177	470P	10	10	C204
4822 111 30328	330	5	CR16	R205	4822 123 5322 123		10N	=20+80		C 205
4822 110 63125	4.7K	5	CR25	R206	4822 12		47P 1N	2 10	50 100	C206 C207
4822 110 63147 4822 110 63107	33K 1K	5 .5	CR25 CR25	R207 R208	5322 12		68M	10	6.3	
4822 110 63125	4.7K	5	CR25	R209	4822 12	2 31043	3.9P	2	63	C 209
4822 110 63152	47K	5	CR25	R210	4822 12	2 31173	220P	10	100	C211
4822 110 63107	1K	5	CR25	R211	4822 12		220P	10	100	C212
4822 110 63138	15K	5	CR25	R212	4822 123		4709	10	100	C213
4822 111 30067	33	5	CR16	R213	4822 123 5322 124		10N 15M	-20+80	63 16	C214 C215
4822 110 63134 4822 110 63141	10K 18K	5 5	CR25 CR25	R214 R215	4822 12		1N	10	100	C216
4822 110 63101	560	5	CR25	R216	5322 12		47P	2	100	C217
4622 111 30264	2.7K	5	CR16	R217	4822 12		47P	10	100	Ç218
4822 111 30323	270	5	CR16	R218	4822 12	3 30043	1.04	- 20 . 00	4.3	
4822 111 30272	680	5	CR16	R219	4822 123		10N 1N	<b>+20+80</b> 10	63 100	C219 C220
4822 111 30245	47	5	CR16	R220	5322 12	2 34043	47P	2	50	C221
4822 111 30347	10	5	CR16	R221	4822 122	31175	1N	10	100	C222
4822 110 63161 4822 110 63116	100K 2•2K	5 5	CR25	R222 R223	4822 122	2 31175	ĨN	10	100	C223
4822 110 63125	4.7K	5	CR25	R224	5322 124	4 14079	68M		6.3	C224
4822 110 63134	10K	5	CR25	R225	4822 12	30043	100	-20+80	63	C225
4822 110 63098	470	5	CR25	R226	4822 123 4822 123	2 31072	47P	10	100	C226
			_		4022 126	2 31173	220P	10	100	C227
4822 110 63116 4822 110 63054	2.2K 10	5 5	CR25 CR25	R227 R228						
4822 111 30272	680	5	CR25	R229						
4822 110 63098	470	5	CR 25	R230						
4822 110 63116	2.2K	5	CR25	R231	Ordering	no	Descri	ption		Item
4822 110 63125	4.7K	5	CR25	R238	5322 130	3/283	HP5082	-2835		GR203
					5322 130		HP5082			GR 204
					5322 130		BA379			GR205
					5322 130		BA379			GR206
	_				5322 130		BA379			GR207
Ordering no	Descri	ption		Item	5322 130		BAW62			GR208
5322 158 14119	COIL			L201	5322 130		HP5082			GR209 GR210
5322 158 14119	COIL			L202	5322 130 5322 130		HP5082 BZX79=			GR211
5322 158 10276		ANCE 4	.TMH	L203	5322 209		0M334	0.45		IC201
5322 158 14119	COIL			L204		85414	DM334			10202
4822 526 10025 4822 526 10025	FXC BE			L205 L207	5322 209	84721	SP6708	ļ.		10203
4822 526 10025	FXC BE			L208		84163	SN7274			10204
4822 526 10025	FXC BE			L209	5322 209		SN7274	1P		10205
4822 526 10025	FXC BE			L210	5322 209 5322 209		SN7474 SN7474			IC206 IC207
5322 526 14019	BEAD			L211	4822 130		BC548B			T\$201
5322 265 54006	FEMALE CO	ONNECTO	R BUZ	01 1	5322 130		BC178B			TS202
5322 265 54018	MALE CON	NECTOR	BUZ		5322 130		BFR90			TS203
5322 535 94711	DISTANCE	PIECE	FOR	ŬZ Ž	4822 130		BC548B			T5204
5322 462 34054			FOR	U2 2	5322 130		BC108B			TS205
5322 255 44122				1	5322 130		BA379			GR 201
5322 255 40089	IKANSIST(	א אטננ	EK TUL	5 <b>3</b> 2	5322 130	<b>34304</b>	BA379			GR 202

Ordering no	Ω	%	Type	Item	Ordering no	F	% \	<b>/</b>	Item
5322 116 54393	150	5	PR52	R201	5322 122 34071	470P	20	50	Ç201
5322 116 54396	68	5	PR52	R202	5322 122 34071	470P		50	C202
5322 116 54396	68	5	PR52	R203	5322 122 34071	470P	20	50	C203
5322 116 50417 4822 111 30328	162 330	5 5	MR25 CR16	R204 R205	5322 122 34071 4822 122 30043	470P 10N	20 -20+80	50 63	C204
4822 110 63125	4.7K	5	CR25	R206	5322 122 34043	47P	10	50	C206
4822 110 63147	33K	5	CR25	R207	4822 122 31175	1N	10	100	C207
4822 110 63107	1K	5	CR25	R208	5322 124 14079	68M	-10+50	6.3	C208
4822 110 63125 4822 110 63152	4.7K 47K	5 5	CR25 CR25	R209 R210	5322 122 34043 4822 122 31173	47P	10	50	C209
4822 110 63107	1K	5	CR25	R211	4822 122 31173	220P 220P	10 10	100 100	C210
4822 110 63138	15K	5	CR25	R212	4822 122 31173	220P	io	100	Ç212
4822 111 30348	27	5	CR16	R213	5322 122 34071	470P	10	50	C213
4822 110 63134	10K	5 5	CR25 CR25	R214 R215	4822 122 30043	10N		63	C214
4822 110 63141 4822 110 63094	18K 330	5	CR25	R216	5322 124 14036 4822 122 31175	15M 1N	-10+50 10	16 100	C215 C216
4822 111 30265	2.2K	5	CR16	R217	5322 122 34071	470P	20	50	C217
4822 111 30331	470	5	CR16	R218	5322 122 34042	12P	10	50	C218
4822 111 30312 4822 111 30327	4.7K	5 5	CR16 CR16	R219 R220	4822 122 30043	10N	-20+80		C219
4822 111 30347	220 10	5	CR16	R221	4822 122 31175 4822 122 30043	1N 10N	10 =20+80	100 63	C220 C221
4822 110 63161	100K	5	CR25	R222	5322 122 34043	47P	10	50	C222
4822 110 63116	2.2K	5	CR25	R223	5322 122 34071	470P	20	50	<b>C223</b>
4822 110 63116	2.2K	5	CR 25	R224	5322 124 14079	68M	-10+50	6.3	C224
4822 110 63134 4822 110 63098	10K 470	5 5	CR25 CR25	R225 R226	5322 122 34071	470P	10	50	C225
4822 110 63116	2.2K	5	CR25	R227	4822 122 31072 5322 122 34071	47P 470P	2 20	100 50	C226 C227
4822 110 63054	10	5	ÇR25	R228	4822 122 31072	47P	2	100	C228
4822 111 30272	680	5	CR16	R229	4822 122 30043	10N	-20+80	63	Ç229
4822 110 63098 4822 110 63116	470 2.2K	5 5	CR25 CR25	R230 R231	5322 122 34043	47P	10	50	C230
4822 111 30324	100	5	CR16	R233	4822 122 31054	10P	2	100	C231
4822 111 30328	330	5	CR16	R234					
4822 111 30328	330	5	CR16	R235					
4822 110 63098	470	5	CR16	R236	Ordering no	Descr	intion		Item
4822 110 63069 4822 110 63125	39 4.7K	5 5	CR16 CR16	R237 R238	5322 209 85414	OM334	1,51.0.1		10201
1022 110 03125	441,0	-	••	1,440	5322 209 85414	0M334			10202
					5322 209 84725	SP8616			10203
					5322 209 84165 5322 209 84165	SN7274			10204
					5322 209 84165	SN7274 SN7474			10206
	_				5322 209 84165	SN7474			10207
Ordering no	Descrip	tion		ltem	5322 209 84729	SP8600			10208
				•	4822 130 40937 5322 130 40348	BC548B BC178B			T\$201 T\$202
5322 158 14119	COIL			L201	5322 130 44179	BFR90			T\$203
5322 158 14119	COIL			L202	4822 130 40937	BC5488			T\$204
5322 158 10276	INDUCT	TANCE	4.7MH	L203	5322 130 40343	BC108B			T\$205
5322 158 14119 5322 158 14119	COIL			L204 L205	5322 130 44435	2N5770	1		T\$206
5322 158 14119	COIL			L206	5322 130 34364 5322 130 34364	BA379 BA379			GR201 GR202
5322 158 14119	COIL			L207	5322 130 34283	HP5082	-2835		GR203
5322 158 14119	COIL			L208	5322 130 34283	HP5082	-2835		GR204
5322 157 44024 4822 526 10025	COIL FXC B	FΔD		L209 L210	5322 130 34364	BA379			GR205
4822 526 10025	FXC BI			L211	5322 130 34364	BA379			GR 206
4822 526 10025	FXC BI	EAD		L212	5322 130 34364 5322 130 30613	BA379 BAW62			GR207 GR208
4822 526 10025	FXC B			L214	5322 130 34283	HP5082	2=2835		GR 209
5322 265 54006	FEMALE C				5322 130 34283	HP5082			GR210
5322 265 54018	MALE CON				5322 130 30666	BZX79	C7V5		GR211
5322 535 94711 5322 255 44122	DISTANCE	R 14	E FUR PINS DIL	U2 2	5322 130 34364 5322 130 30666	BA379 BZX79-	.C7V5		GR212 GR213
5322 255 40089	TRANSIST	OR HO	LDER TOT	8-3 2	5322 130 30666	BZX79-			GR214
5322 462 34054			•	2	5322 130 30411	BZX79-			GR215

## CODING SYSTEM OF FAILURE REPORTING FOR QUALITY ASSESSMENT OF T & M INSTRUMENTS

(excl. potentiometric recorders)

The information contents of the coded failure description is necessary for our computerized processing of quality data.

Since the reporting of repair and maintenance routines must be complete and exact, we give you an example of a correctly filled-out PHILIPS SERVICE Job sheet.

<b>1 2</b>	<b>3</b>		<b>4</b>
Country Day Month Year	Typenumber /	Version	Factory/Serial no.
3 2 1 5 0 4 7 5	0 P M 3 2 6 0	0 2	D 0 0 0 7 8 3
CODED	FAILURE DESCRIPT	TION	6
	Component/s	equence no.   Ca	ategory
Installation  Pre sale repair  Preventive maintenance Corrective maintenance Other	<del>   </del>	5 7 5 3 1 2 0 1 4	Job completed  Working time  Hrs
Detailed description of the information	on to be entered in the	various boxes:	
①Country: 3 2 = Switzerland	=7 .===		
	5 = 15 April 1975		
③Type number/Version O P M 3	·		A 3260, version 02 (in later is number is placed in front of
⊕ Factory/Serial number D 0 0 0  □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □		These data are the instrument	mentioned on the type plate of
<b>⑤</b> Nature of call: Enter a cross in the <b>⑥</b> Coded failure description	e relevant box		
Location	Component/sequence	no. (	Category
These four boxes are used	These six boxes are i	ntended to	0 Unknown, not applicable (fault
to isolate the problem area.	pinpoint the faulty o	-	not present, intermittent or
Write the code of the part in which the fault occurs, e.g. unit no or mechanical item no of this part (refer to 'PARTS LISTS' in the manual).  Example: 0001 for Unit 1 000A for Unit A 0075 for item 75  If units are not numbered, do not fill in the four boxes; see Example Job sheet.	A. Enter the comport designation as used in diagram. If the design alfa-numeric, the letter written (starting from in the two left-hand the figures must be vocupies the right-mount of the four right-hand by the four four the four right-hand by the four four four fuse, board, 1990005 Holder (valve fuse, board, 1990006 Complete un board, h.t. 1990007 Accessory (complete fuse, board, 1990008 Documentation in the four fuse, board, 1990008 Documentation in the four fuse, 1990008 Documentation in the fuse fuse, 1990008 Documentation in the fuse fuse fuse fuse fuse fuse fuse fus	n the circuit nation is rs must be not the left) boxes and written (in last digit st box) in boxes. d in the left applicable lock (text left n, grip, rail, left) dial knob, cap, lif attached the left applicable lock (text left n, grip, rail, left not left	disappeared)  1 Software error  2 Readjustment  3 Electrical repair (wiring, solder joint, etc.)  4 Mechanical repair (polishing, filing, remachining, etc.)  5 Replacement (of transistor, resistor, etc.)  6 Cleaning and/or lubrication  7 Operator error  8 Missing items (on pre-sale test)  9 Environmental requirements are not met
	supplement, 990009 Foreign obje 990099 Miscellaneou	ct	

- ① Job completed: Enter a cross when the job has been completed.
- Working time: Enter the total number of working hours spent in connection with the job (excluding travelling, waiting time, etc.), using the last box for tenths of hours.

Ordering no	Ω	%	Type	ltem	Ordering no	F	%	V	ltem
5322 116 54393	150	5	PR52	R201	5322 122 34071	470P	20	50	Ç201
5322 116 54396	68	5	PR52	R202	5322 122 34071	470P	20	50	C202
5322 116 54396 5322 116 50417	68 162	5	PR52 MR25	R203 R204	5322 122 34071 5322 122 34071	470P 470P	20 20	50 50	C203
4822 111 30328	330	5	CR16	R205	4822 122 30043	100	-20+80		Ç205
4822 110 63125	4.7K	5	CR25	R206	5322 122 34043	47P	10	50	C206
4822 110 63147	33K	5	CR25 CR25	R207 R208	4822 122 31175	1N 68M	10 =10+50	100	C207 C208
4822 110 63107 4822 110 63125	1K 4.7K	5 5	CR25	R209	5322 124 14079 5322 122 34043	47P	10	50	C209
4822 110 63152	47K	5	CR 25	R210	4822 122 31173	220P	10	100	C210
4822 110 63107	1K	5	CR25	R211	4822 122 31173	220P	10	100	C211 C212
4822 110 63138 4822 111 30348	15K 27	5 5	CR25 CR16	R212 R213	4822 122 31173 5322 122 34071	220P 470P	10 10	100 50	C212
4822 110 63134	10K	5	CR 25	R214	4822 122 30043	10N	-20+80		C214
4822 110 63141	18K	5	CR25	R215	5322 124 14036	15M	-10+50		C215
4822 110 63094 4822 111 30265	330 2.2K	5 5	CR25 CR16	R216 R217	4822 122 31175 5322 122 34071	1N 470P	10 20	100 50	C216 C217
4822 111 30331	470	5	CR16	R218	5322 122 34042	12P	10	50	C218
4822 111 30312	4.7K	5	CR16	R219	4822 122 30043	10N	-20+80		C219
4822 111 30327 4822 111 30347	220 10	5 5	CR16 CR16	R220 R221	4822 122 31175 4822 122 30043	1N 10N	10 +20+8(	100	C220
4822 110 63161	100K	5	CR 25	R222	5322 122 34043	47P	10	50	6222
4822 110 63116	2.2K	5	CR25	R223	5322 122 34071	470P	20	50	C223
4822 110 63116 4822 110 63134	2.2K	5 5	CR 25	R224 R225	5322 124 14079	68M	-10+50		C224
4822 110 63098	10K 470	5	CR25 CR25	R226	5322 122 34071 4822 122 31072	470P 47P	10 2	50 100	C225 C226
4822 110 63116	2.2K	5	CR25	R227	5322 122 34071	470P	20	50	C227
4822 110 63054	10	5	CR25	R228	4822 122 31072	47P	2	100	C228
4822 111 30272 4822 110 63098	680 470	5 5	CR16 CR25	R229 R230	4822 122 30043	10N	-20+80	63 50	C229 C230
4822 110 63116	2.2K	5	CR25	R231	5322 122 34043 4822 122 31054	47P 10P	10 2	100	C231
4822 111 30324	100	5	CR16	R233		•••	_		
4822 111 30328	330	5	CR16	R234					
4822 111 30328 4822 110 63098	330 470	5 5	CR16 CR16	R235 R236					
4822 110 63069	39	5	CR16	R237	Ordering no	Descr	iption		Item
4822 110 63125	4.7K	5	CR16	R238	5322 209 85414 5322 209 85414	0M334 0M334			1C201 1C202
					5322 209 84725	SP8616	В		10203
					5322 209 84165	SN7274	15		10204
					5322 209 84165 5323 209 84165	SN7274 SN7474	-		1C205 1C206
					5322 209 84165 5322 209 84165	SN7474			10207
Ordering no	Descrip	otion		Item	5322 209 84729	SP8600	В		10208
				•	4822 130 40937	BC5488			T\$201 T\$202
5322 158 14119	COIL			L201	5322 130 40348 5322 130 44179	BC1788 BFR90	,		TS202
5322 158 14119	COIL			L202	4822 130 40937	BC548B	}		T\$204
5322 158 10276		TANCE	4.7MH	L203	5322 130 40343	BC1088			T\$205
5322 158 14119 5322 158 14119	COIL			L204 L205	5322 130 44435 5322 130 34364	2N5770 BA379	,		TS206 GR201
5322 158 14119	COIL			L206	5322 130 34364	BA379			GR202
5322 158 14119	COIL			L207	5322 130 34283	HP5082			GR203
5322 158 14119 5322 157 44024	COIL			L208 L209	5322 130 34283	HP5082	2-2835		GR204
4822 526 10025	FXC B	EAD		L210	5322 130 34364 5322 130 34364	BA379 BA379			GR205 GR206
4822 526 10025	FXC B			L211	5322 130 34364	BA379			GR207
4822 526 10025 4822 526 10025	FXC B			L212 L214	5322 130 30613	BAW62			GR208
	FEMALE (		TOR BUZ		5322 130 34283 5322 130 34283	HP5082			GR209 GR210
5322 265 54018	MALE COM	INECTO	R BUZ		5322 130 30666	BZX79			GR211
5322 535 94711	DISTANCE	PIEC	E FOR	Ú2 2	5322 130 34364	BA379			GR212
5322 255 44122 5322 255 40089	TRANSTS	:R 14	LDER TO	1 8=3 2	5322 130 30666	BZX79			GR213 GR214
5322 462 34054	GUIDE RA	AIL	TOUR TOT	2	5322 130 30411 5322 130 30411	BZX79			GR214
7-85 '86 9199'							•-•		

## CODING SYSTEM OF FAILURE REPORTING FOR QUALITY ASSESSMENT OF T & M INSTRUMENTS

(excl. potentiometric recorders)

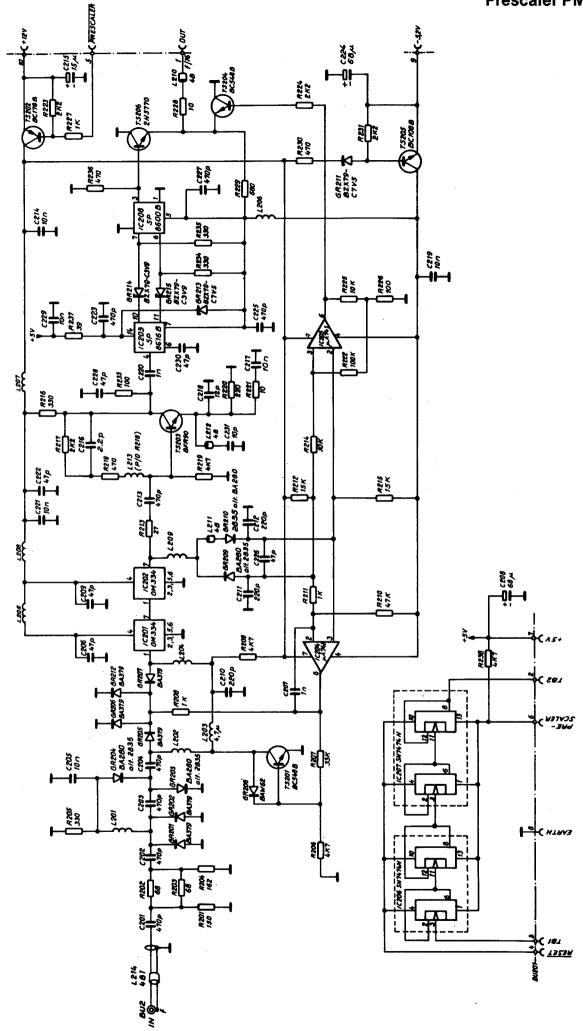
The information contents of the coded failure description is necessary for our computerized processing of quality data.

Since the reporting of repair and maintenance routines must be complete and exact, we give you an example of a correctly filled-out PHILIPS SERVICE Job sheet.

<b>①</b>	2	3		4
Country · C	Day Month Year	Typenumber	/Version	Factory/Serial no.
3 2 1	5 0 4 7 5	0 P M 3 2 6	0 0 2	D O 0 0 7 8 3
	CODED	FAILURE DESCR	PTION	<b>6</b>
5				
Nature of c	all Location	Componen	t/sequence no. Ca	ntegory
Installation Pre sale rep Preventive maintenanc Corrective maintenanc Other	pair 0 0 2 1	T S 0 6 R 0 0 6 9 9 0 0	3 1 2	Job completed  Working time  Hrs
	otion of the information  2 = Switzerland	on to be entered in t	ne various boxes:	
②Day Month Y	ear 1 5 0 4 7 5	= 15 April 1975		
③Type number	/Version OPM3	8 2 6 0 0 2 =	•	1 3260, version 02 (in later is placed in front of
## Factory/Serial ## Index of the image	I number D O 0 (	0 7 8 3 = DO 7	83 These data are i the instrument	mentioned on the type plate of
⑤ Nature of cal ⑥ Coded failure	I: Enter a cross in the description	e relevant box		
Location		Component/seque	nce no.	Category
These four boxe to isolate the pr Write the code	oblem area.	These six boxes ar pinpoint the fault A. Enter the comp	component.	Unknown, not applicable (fault not present, intermittent or disappeared)
no or mechanic of this part (ref LISTS' in the n Example: 0001 000A 0075	ier to 'PARTS nanual).	designation as used diagram. If the desalfa-numeric, the lewritten (starting from the two left-har the figures must be such a way that the occupies the right-	signation is tters must be rom the left) and boxes and e written (in ne last digit	1 Software error 2 Readjustment 3 Electrical repair (wiring, solder joint, etc.) 4 Mechanical repair (polishing, filing, remachining, etc.) 5 Replacement (of transistor, resistor, etc.)
	boxes; see Example	the four right-hand B. Parts not identi circuit diagram: 990000 Unknown 990001 Cabinet o	l boxes. fied in the /Not applicable r rack (text olem, grip, rail,	6 Cleaning and/or lubrication 7 Operator error 8 Missing items (on pre-sale test) 9 Environmental requirements are not met
		990007 Accessory	ly if attached nent) associated plugs alve, transistor, d, etc.) unit (p.w. t. unit, etc.) (only those ype number) tation (manual, nt, etc.)	

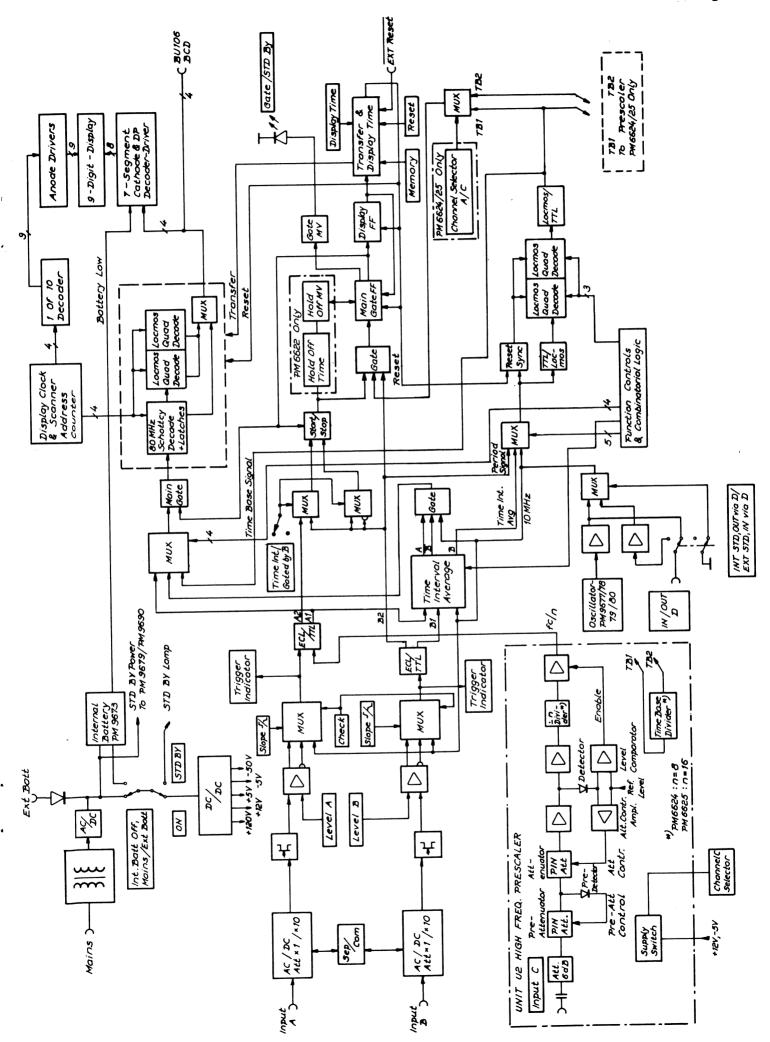
- ① Job completed: Enter a cross when the job has been completed.
- Working time: Enter the total number of working hours spent in connection with the job (excluding travelling, waiting time, etc.), using the last box for tenths of hours.

7 13237



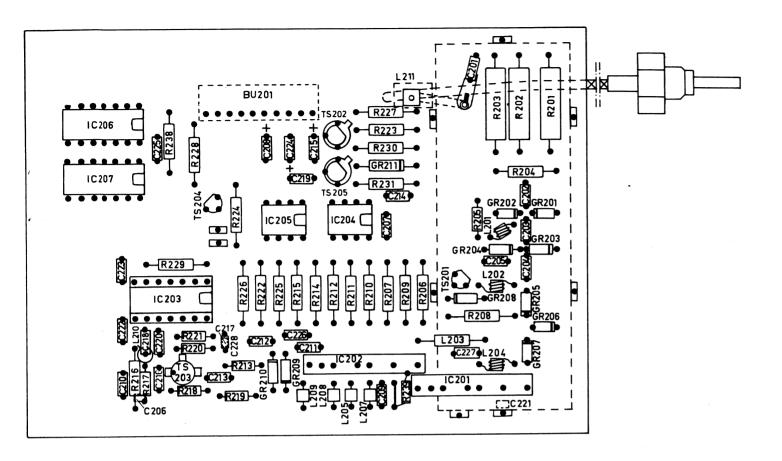
## Standard symbols for logic elements

		DIN norm	American	Boolean
Circuit	1.E.C.	40700	standard	function
AND	A & X	в x	A	X=AB
OR	A≥1X	A	A	X= A+ B
NAND	A — & ⊳- X B — & •- X	AX	A D X	X=AB
NOR	A>1 > X	A B X	A	X = <u>Y + B</u>
NAND with one inverting input	A -C & -X	A	A- B- C X	X=ĀB
NOR with one inverting input	A -C >1 D-X	AX	A B	X= <del>A+</del> B
INHIBIT GATE	å⊒³1–×		å c ⇒ ×	X=(A+B) C
EXCLUSIVE OR	A = 1 - X	A - X	A — X	X=A <del>B+A</del> B
COMPARATOR	A = X	AX	A	X=AB+AB
Distributed AND	<b>&amp;</b>			
Distributed OR	<b>&gt;</b> 1			
DELAY	<u>-</u> E-		<del>-</del>	
FLIP-FLOP	13	1 - 0	-FY	

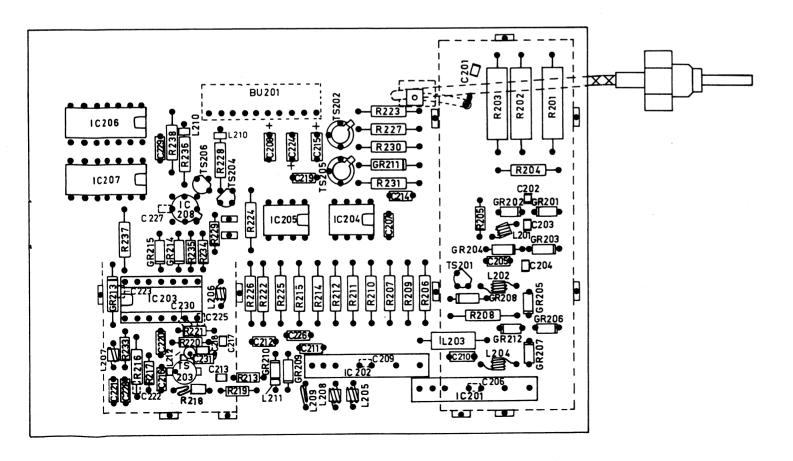


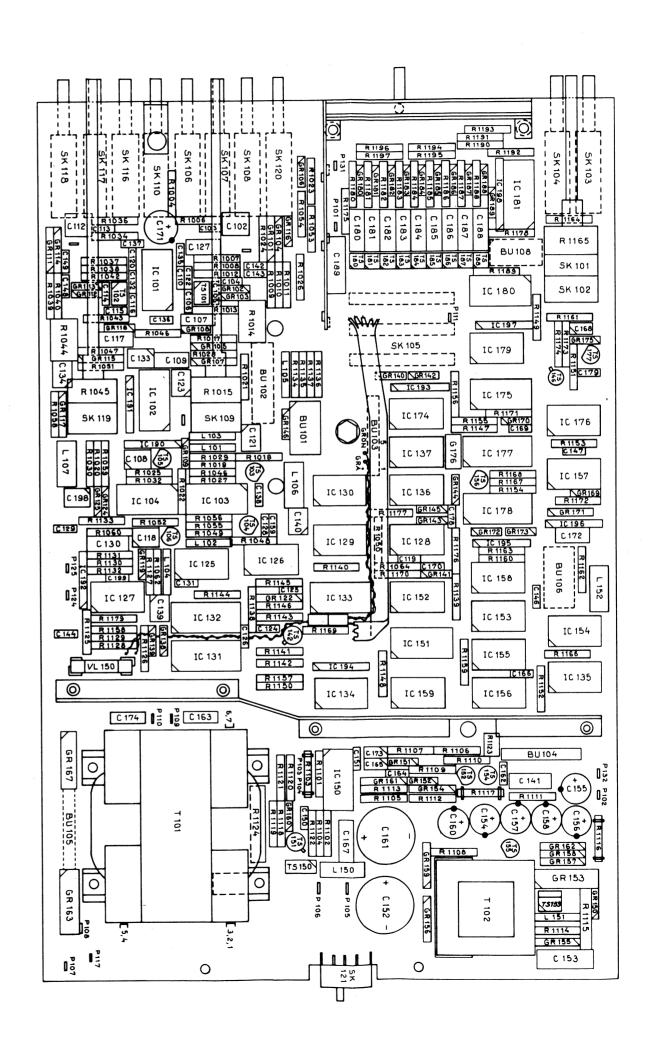
ChannelC

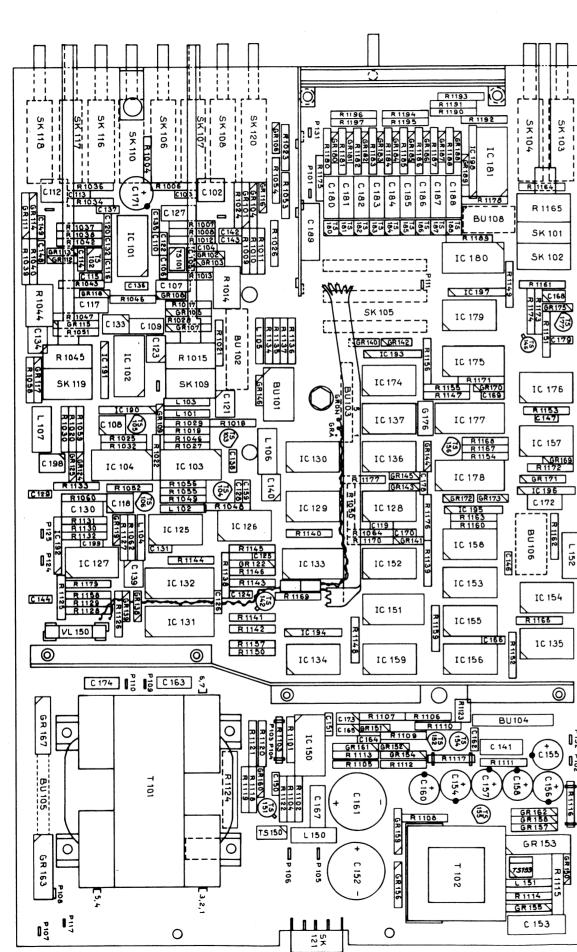
16-191



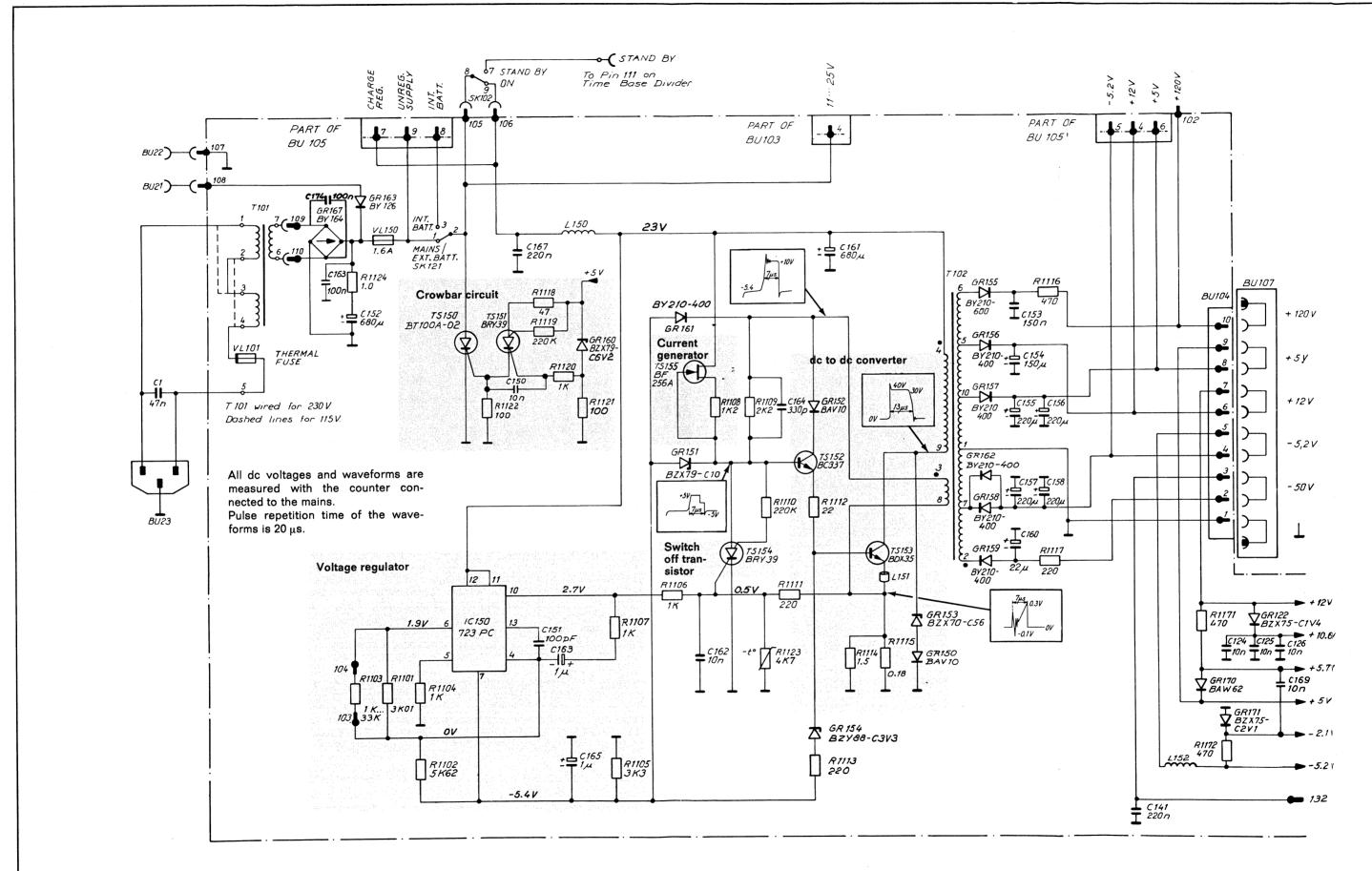
## Prescaler PM 6625







Basic board



		•
		•
		•

